RAILROAD GAZETTE

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Contributions

The "Language Order" of the Lehigh.

Easton, Pa., Aug. 9, 1901.

To the Editor of the Railroad Gazette.

The recent order of the Lehigh Valley Railroad, requiring the crews of shifting engines to use only the English language while on duty, meets with universal approbation here. The order says that "under no circumstances shall Pennsylvania German be spoken," and it is said to have been issued for the reason that recently a serious collision nearly resulted because a conductor gave directions to his crew in this language, and a brakeman who did not understand it perfectly shifted cars to the wrong track. As the rules are printed in English, the railroad officials are plainly in the right in insisting that this language shall be exclusively used by its employees while on duty.

What kind of a language is this Pennsylvania German tongue, which requires such an unusual order to be issued to railroad crews? It is a strange combination of English and the German dialect spoken in northern Bavaria. Here is a stanza describing a locomotive, taken from a poem, entitled "Fawra in der Train," which is said to be sung to the tune of "Michael Schneider's Party" at picnics in eastern Pennsylvania:

Nou fawrt mer mit der insheinkawrs,
Des is ein eisner goul,
Der shnouft un hechst wie oner fe,
Duch sicht mer gar kein moul.
Der ward net meed, un won er shpringt
En hunnert dousend meil;
Do hat er shur der forzug weit
Fur oll de onra geil.

Here is a description of the effect upon the passengers of an accident to the train, with a statement of its cause:

Nou gebt's en weshtr aksident,
Es is olles gons ferkart,
De weibsleit wara omechtlich,
De monsleit sin ferstart,
Der insheineer blost marderlich,
Der inshein gat druf los,
Nun shpringt sie weder'n olta koo—
Wos gebt'r dos en shtos!

A quarter of a century ago it was said that this language was dying out and would soon be no more. Such prophecies, however, have proved to be false, for it is now spoken more widely than ever before. Two millions of people in Pennsylvania, and probably a million more who have emigrated from Pennsylvania to the middle West, use it in daily conversation. Even in cities like Allentown and Reading no merchant can be successful in business unless his employees are proficient in its use. On the trolley lines and in the railroad yards employees may be heard employing it constantly in social conversation. These men speak English well but it is easier for them to chat in this strange dialect, which is governed by no rules of grammar. It seems that they are using it even when on duty, but the safety of the public demands that this practice shall be stopped, and the employees themselves will doubtless all agree that the Lehigh Valley Railroad has done a good thing in issuing the order.

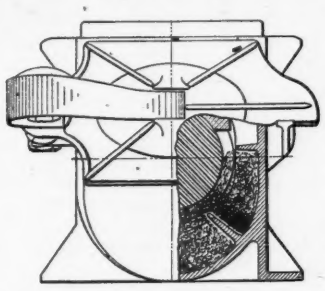
G. O. Meter.

The Ribbed (Symington) Journal Box.

Baltimore, Md., Aug. 13, 1901.

To the Editor of the Railroad Gazette.

A great deal of trouble is experienced on some lines on account of the waste getting caught between the brass and the journal, and we have therefore added to our journal boxes two ribs just above the center line of the journal, as shown in the cut. It is difficult to get the inspector to get enough waste on the sides of the journal without getting it too high; these upper ribs in combination with the ribs for supporting the packing and oil on the sides enable the inspector to put the waste exactly where it is wanted and prevent his getting the waste too high on the sides.



After the box is packed these ribs also prevent the waste on the sides of the journal from rolling up with the journal and getting caught beneath the brass, producing what is usually known as a waste grab.

In the discussion at the Master Car Builders' convention on the subject of standards, Mr. Rhodes remarked that he thought the round bottom box was wrong construction, as it was his experience that after a run of 100 to 150 miles the waste had all rolled up on one side in the direction in which the journal was revolving, and that what these boxes then needed was not oil but attention. He further said that he thought we should have a standard box with the bottom so shaped that it would hold the waste in position.

I am quite satisfied from my own observation that the waste does not slide on the bottom of the box at all; it is simply the top part of the packing that is in contact with the journal that rolls on the bottom part of the packing, and the shape of the bottom of the box I believe has really nothing to do with it. The ribs, as shown in the cut attached, entirely prevent this movement of the packing in contact with the moving journal, and by their use it is impossible for an inspector to pack a box improperly.

T. H. Symington.

Railroads in Guatemala.

Gualan, Guatemala, July 1, 1901.

To the Editor of the Railroad Gazette.

An American railroad man landing in Guatemala (Port Barrios) encounters various surprises, the first one of consequence being, perhaps, the answer of the ticket agent to his inquiry as to what is the railroad fare to Guatemala City, which is about 190 miles away, and 50 miles beyond the terminus of the railroad. The price of the ticket to the railroad terminus, 140 miles, is $14, or 10 cents a mile. Being determined, however, to comply with all reasonable requirements, you hand out $15 in American money; and, on getting your change, receive the second surprise, as the agent hands back your $10 United States note, and $16 in Guatemala money besides. You now learn that one American dollar will buy $6 in Guatemala.

You find the passenger train a very good one. Everything is in excellent condition and the engine is a fine one. The train is equipped with air-brakes. The track is very poor. The rails are heavy for a narrow gage road, but the track is badly out of line. The ties are mahogany, rosewood and ebony, but even ebony lasts only about two years. The train runs at about 10 miles an hour and makes long stops. The road has nine locomotives, mostly Baldwins several years old; 25 passenger cars, 10 of which are first-class; 200 box cars and 20 flats.

Locomotive engineers get $8 a day for a run of 80 miles; conductors $7 a day, with no overtime; brakemen $75 a month, and negro firemen the same. Agents get from $100 to $250 a month, most of them receiving about $200. The operators are all natives. The chief despatcher gets $300, which, be it remembered, is equivalent only to $50 of American money. An American cannot live here for less than $150 a month. I find that the other two roads in this country pay about the same as this one, except that on one of them enginemen get $10 a day. Any railroad man in the United States who has even the poorest kind of a position on a good road, will do well to keep it, rather than try Guatemala.

Kraemer.

The Catalpa Speciosa for Railroad Use.

Boston, Aug. 14, 1901.

To the Editor of the Railroad Gazette.

In your Aug. 9 issue, page 563, you mention the Catalpa planted by the Rio Grande Western Railway as only for ornamental use. It was through my efforts that this company planted 65,000 trees and seed for 100,000 trees at Provo, Utah, for growing cross-ties. Also, through my efforts the Big Four Railway planted 75,000 trees, two years ago, for the same purpose.

Every day I am seeing fresh evidences that the Catalpa speciosa is the very best American tree for the uses of railroads. Yesterday I saw out on the bleak, exposed sands at the extreme end of Cape Cod several Catalpa speciosa trees, growing thriftily. One eight years planted is 8 in. in diam.

Fifty railroads have signified their intention to take up the matter of tree planting speedily; all others should do so. Letters from presidents of railroads in the heart of white oak territory show that white oak as a cross-tie is practically at an end.

Rapid growth, extreme durability, no necessity for chemical treatment for preservation, hardiness, and wide distribution of the tree in experiments proving its adaptability to all soils and locations, make the Catalpa the tree for ties, telegraph poles, mining timbers and inside finish for cars; an all around tree for railroads.

John P. Brown.

[Our information about the planting of the Catalpa on the Rio Grande Western was from official sources. We do not doubt that Mr. Brown thought the trees were planted for cross-tie timber; nor do we doubt that the officers of the road had other ideas in mind. All this is quite immaterial for the present; the important thing is to get the railroads to grow and protect timber.—Editor.]

Rail Steel—With Especial Reference to Its Hardness.

At the Sixth Session of the International Railway Congress, held last year in Paris, several reports were presented on the "Nature of the Metal for Rails," especially a very voluminous report by Mr. P. H. Dudley. We have never found time to make any satisfactory brief of these reports—much less could we print them in full. The sectional discussion has just reached us in the *Bulletin* of the Congress, and as that summarizes the reports in some degree and gives the views of certain eminent authorities we print it at considerable length. It will be seen that the most attention was paid to the relative hardness or softness of rail steel.

Mr. Post (Engineer Netherlands State Railroads).—To me has been assigned the honor of bringing before you the report of the late Mr. Bricka, to whom the Congress is so deeply indebted for his many eminent services and to whose memory I desire to do homage.

Mr. Bricka's report summarizes the present position of the question concerning the nature of the metal for rails. Mr. Bricka demonstrated the tendency, especially in France, towards increasing the minimum hardness allowed, and requiring an ultimate tensile strength of 70 kilograms per square millimeter (44.4 tons per square inch). . . .

The data collected fail to establish any relation between the hardness of rails and that of tires. The ultimate tensile strength of tires varies from 50 to 85 kilograms (31.7 to 54 tons per square inch). As a rule, the steel is hard in the case of tires for locomotives and vehicles intended for express trains and soft for slow trains.

As regards the means of obtaining homogeneity in rails of heavy section, Mr. Bricka's report points out the necessity for increasing the power of the rolling mill in proportion to the increase in cross section, as this renders it possible to lessen the inequalities of texture and of chemical composition observed by Mr. von Dormus.

With reference to the rolling, the cross section of the rail must be balanced, that is, the ratio of the head to the base must not differ too much from unity. . . .

The average wear of the rail head is about 1 millimeter (0.039 in.) per 100,000 trains, where braking does not take place. Where brakes are used the wear of the rails may be as much as five times this amount. . . .

Most managements who have tried the microscopic etching test have failed to obtain any very conclusive results; but still this method seems likely to prove of extreme value in checking the manufacture of rails.

I took the liberty of asking the St. Gothard Railway to supply me with some additional information beyond what had already been sent to Mr. Bricka. . . . The St. Gothard had undertaken 87,000 measurements of the height of their rail heads to determine the normal wear under different conditions of profile and gradient. The following is a brief summary of the data supplied by the St. Gothard Company as the outcome of this wholesale investigation. The vertical wear for a million tons gross carried was:

0.00284 in. on the north grade (mountain line).
0.00201 in. on the south grade (mountain line).
0.00209 in. on their lines over the plains.
0.00215 in. on the Cenere line.
0.00224 in. on the whole system.
0.00134 in. for the whole of those sections on the straight.

. . . With the utmost deference I submit that it is not yet proven, though the very words seem to imply it, that hard rails resist regular wear or local wear better than soft rails, and until we get more definite data the question must, I think, remain an open one. . . .

Mr. P. H. Dudley (Reporter for the United States).—I must content myself, gentlemen, with drawing your attention to the data given on pages 63 to 69 of my report (1), to the tables on the subsequent pages showing the decreased cost of using rails of heavy section, and to my general conclusions which are as follows:

1. As the permanent way becomes physically weak for the increasing traffic, more labor must be employed in its care and repairs to the equipment.

2. When the permanent way is made physically strong by stiff and smooth rails, less labor is required for its care and repairs to the equipment, and all the operating and maintenance expenses decrease.

3. When stiff and heavy rails are used, unless made of a high grade of steel and proper width of head, the loss of metal will be faster for a given traffic than on weak and light rails.

4. On stiff rails the deflections in distributing the wheel loads to the ties are much less, the area of contact between the wheel and rail is reduced. Therefore the intensity of pressure of the wheel loads transferred to the ties, ballast and roadbed is reduced, the main economic feature of heavy rails.

5. The stiff rails in distributing the wheel loads over a larger area of roadbed increase the stability of the track, save labor, ties and roadbed by transferring from them the destructive work to the metal of the rail head, for which provision can be made. This will now require attention and study by the railroad companies. Too little care has been paid to this important matter in the past, and as the traffic has increased and the heavier sections been introduced, they have entirely changed the economic relations of the wear and deterioration of the permanent way.

6. The injury to the ties and roadbed has been so much reduced by the heavy rails, that ties properly treated could be introduced and used with economic results in the United States.

7. Close attention is paid to the number of miles locomotive and passenger coach axles are permitted to run, but hardly a thought has been given to the limitations of the life of rails due to the repetitions of stresses which take place in the metal of the rails due to the wheel loads of the passing trains. This feature will have as much to do with the limitation of the life of the rails as the question of the wear of the head of the rail.

8. We cannot expect for a return to lighter loads and slower speeds of trains. These are likely to increase. As a measure of safety it is well that the rails do wear rapidly, as that insures removal before they get extremely dangerous as girders.

9. The principle, that the equipment and permanent way form a single means of transport is now established and, that each one should be designed for the other is now established.

10. In all of this work principles must be followed, adapting the construction to the conditions of service. For final economic results the main dependence must be in its broad sense on "Hard" tough steel, the proper "Nature of the Metal for Rails."

Mr. Sandberg (Swedish State Railway).—As delegate of the Swedish State Railroads I venture to make a few remarks with regard to Mr. P. H. Dudley's report.

The number of details collected and published in this report in reference to the question is somewhat large, and many of them have in my opinion no direct bearing on the subject under discussion. . . . The most important conclusions which I draw from the report are the following:

"1. A heavier rail has been introduced on several railroads, and the result is a more solid line presenting greater security, whilst the life of the rail is increased and cost of maintenance of sleepers diminished.

"2. A uniform specification applying to all kinds of ore and all works alike is absolutely impossible.

"3. The limit of elasticity of the steel should be made the primary condition in determining its quality."

. . . Having been one of the first to introduce heavy rails and having, in 1886, constructed by "Goliath" type of 50 kilograms per meter (100.1 lb. per yard), it is not likely that I should differ in opinion from Mr. Dudley in regard to the advantage to be derived from a rail of this kind. It is true that in Europe we have no inspection cars enabling us to determine the flexibility and undulations of heavy rails; but we know nevertheless that the running is smoother, the line safer and the cost of maintenance greatly reduced. . . .

On the whole of our State railroad system [Sweden], comprising about 4,000 kilometers (2,490 miles) we have from 30 to 100 fractures per annum, all according to the severity of the winter. The State Railroads and a few private lines have adopted my type of 40.5 kilograms (81.6 lb. per yard) and have already laid down about 100,000 tons. . . . Hitherto the results have been very satisfactory.

In Sweden, owing to our rigorous climate, we use a steel of medium hardness. In order to obtain the exact degree of toughness required, we employ drop tests and we measure the permanent deflection obtained on a section of rail taken from each cast; we also make an analysis of the metal with a view to determining its chemical composition; here we limit the percentage of phosphorus to 0.075, but we have found it impracticable to specify an exact chemical composition to be used for rail-steel owing to the considerable variation dependent on the different pig-iron in various districts. I may here refer to the visit of the Iron and Steel Institute to Stockholm. It is really time that engineers ceased to try to pass a uniform specification for all kinds of steel intended for rails. Owing to the above-mentioned variations it is necessary to adopt a wide margin of safety, seeing that there are differences of 0.05 to 0.10 per cent. of carbon in different casts of Bessemer steel. I have always recommended the use of a steel of medium hardness containing about 0.42 per cent. of carbon, which has always given us good results.

In 1898, acting under instructions from my Government, some members of which had been captivated by the reports in American journals on the advantage of a large percentage of carbon in the rails, we made some experiments with steel containing up to 0.60 per cent. of carbon and met with complete failure. We have also tried metal containing 0.46 to 0.50 per cent. of carbon instead of 0.42, but the results, in the severe winter of 1900, were not satisfactory. We then adopted a rail containing 0.42 per cent.; I hope, with the same good results as before. Experience shows us that a rail of medium toughness only breaks at one point, whilst hard rails break into a large number of pieces, which increases the danger of derailment and the risk of accidents.

As an example of a rail of medium toughness we may mention the "Goliath" of 50 kilograms (100.1 lb. per yard), which, having been laid 10 years ago on the Barrow-Furness line, only shows a wear of three millimeters (0.118 in.), with no fracture whatever, and this in spite of very heavy traffic. The proportion of carbon in these rails is 0.43 per cent. The Chief Engineer, Mr. Stileman, promised to give all the required particulars to any one whom this experiment might interest. It will be remembered that these rails were laid alongside of the English type to see whether it was possible to obtain as good a running with rails of the Vignoles type as with English rails with cast-iron chairs. I am of opinion that, in order to determine the limit of elasticity, the drop test is preferable to traction tests, as the latter take too long to make it possible to correct defects of manufacture. From my point of view the steel suggested by Mr. P. H. Dudley is much too hard to be generally adopted. The Bessemer process not producing steel of very uniform composition the quality of which varies greatly, it becomes necessary to provide a wide margin of safety. In England, a steel of fair consistency is obtained, but if we are to believe the reports of Mr. Dudley, this is nothing to the exactness of the calculations of the flexure obtained in America; there, we are told, deviations of $^1/_{100}$ in. are established in the flexure of strips of metal when subjected to a drop test of one ton falling from a height of 16 ft. Neither can we, by subjecting rails to drop tests, foretell the approach of a snowstorm in winter. On the occasion of the visit of the Iron and Steel Institute to Stockholm in 1898, this question of metal for rails was thoroughly discussed, and the conclusion arrived at was a decision to use a heavier rail, but of medium toughness.

We have also this year had another statement on the question of rails, by Mr. R. W. Hunt, of London, and Mr. John F. Wallace, President, admitted that American railroad engineers have hitherto failed to arrive at a decision as to the uniform specification from which their rails shall be manufactured.

In fact, every American railroad is, so to speak, obliged to buy its rails from the works which entrust it with a large portion of their traffic, and these works manufacture the rails from their own specifications, at the same time giving a guarantee of five years.*

With regard to the quality of American rails, I may point out that some of the large railroads in countries close to the United States, such as Canada and Mexico, have this year come back to England to buy their rails in this country, after having been using the American product for several years. Although a low price is not the only element to consider in purchasing rails, America still has a good prospect for the future, owing to the cheapness of coal and pig-iron in that country, but it remains to be seen whether the American rails will satisfy European engineers. Up to the present no great European railroad has used American rails. It is said that in America Siemens-Martin furnaces of 100 tons capacity are being used. Let us hope that we shall see some progress in metallurgy and that the Siemens-Martin process will give us, with the use of inferior ore, purer, more uniform and no dearer metal than Bessemer steel.

In conclusion I may mention that in this question I incline to very cosmopolitan tendencies, and that I shall be very pleased to examine rails in America or any other country offering the best advantage to buyers. The competition of America in the coal and pig-iron markets as well as for rolling stock and rails, will be beneficial to all, even to England.

Mr. Ast (Kaiser Ferdinands-Nordbahn, Austria).—I think, gentlemen, we can all agree to the conclusions proposed by Mr. Dudley at the end of his remarkable report. But I fancy he is going rather far when he asserts that the use of a heavy rail will markedly reduce the injury to the sleepers and the roadbed. In my opinion, he forgets that we must also diminish the stress of the sleepers on the ballast and increase their bearing surface. Let us take a heavy and strong enough rail to carry a locomotive though only supported at its two ends. Unquestionably the fatigue of the sleepers and ballast would be too great. The stiffness of the rail cannot therefore beyond a certain limit make up for the number of sleepers; this number must be sufficient to reduce the stress on the ballast to a suitable extent. In short, the superstructure of the track must form a harmonious whole.

Mr. Dudley's conclusions 5 and 7 cannot therefore be accepted just as they stand.

Mr. Bélélubsky (Ministry for Ways of Communication, Russia).— . . The committee has had laid down experimentally on the Nicolas Railroad rails of different degrees of hardness supplied by Russian firms; these rails have been in use for 10 years. The latest Russian specifications require rails to be of harder steel than was used when our railroad system was in its infancy.

It is worth noting that for the last 20 years, more especially with a view to insuring that rails do not contain too much phosphorus, drop tests liable to be carried out on frozen rails have been prescribed in Russia, and this has caused Russian mills to make rails of very mild steel. The Russian Government has quite recently, in 1899, abandoned this method in view of the growing tendency in Austria, Bavaria and Finland, as also in Russia, to arrive at a uniform method for testing non-frozen rails.

The Russian Ministry for Ways of Communication has instructed the laboratories of the Imperial Institute of Engineers to conduct some researches on rails withdrawn from service after long use, like the English rails, and on rails which after two or three years' service already showed signs of considerable wear. In any case, the question of the hardness of steel for rails remains an open one and ought still to be investigated in the different countries. It is additionally desirable to refrain from any definite decision, inasmuch as the International Association for testing is actively studying the question of homogeneity in steel and iron in view of its next Congress.

But at all events we owe Mr. Dudley our thanks for the remarkable report he has prepared.

Mr. de Kounitsky (Ministry for Ways of Communication, Russia).—I should like to say that the third conclusion of Mr. Dudley's remarkable report is borne out by the Russian practice; this conclusion runs as follows:

"When stiff and heavy rails are used, unless made of a high-grade of steel and proper width of head, the loss of metal will be faster for a given traffic than on weak and light rails."

For a fairly long time the Russian managements refrained from using heavy rails, because the steel formerly manufactured by Russian firms was mild steel. The result was an abnormal wear instead of wear of the running surface. We found wear to be rapid and unequally distributed, especially at the joints. Thus it would be pure waste of metal to use heavy rails under these circumstances. The conclusion of which I have just spoken shows that recent Russian practice, that is, a tendency in the case of heavier rails to use harder steel, is good and that in pursuing this course we are really moving in a progressive direction.

Mr. Siegler (Eastern of France Railway).—I hope the meaning of Mr. Dudley's third conclusion which Mr. de Kounitsky has just supported will be clearly defined.

If it means that heavy rails of equal hardness wear out more quickly than light rails, I cannot accept it. Obviously, if a heavy rail be manufactured of inferior metal, that rail will wear more quickly than a light rail made of metal of better quality. Similarly, no one can pretend that because a rail is heavy it ought to be made of metal of better quality than a light rail. Therefore, this conclusion does not seem to me precise enough, but likely to lead to misunderstanding.

Mr. de Werkhovsky (Ministry for Ways of Communication, Russia).—It has been my proud position to preside for the last 10 years over a committee engaged in testing rails and tires. A summary of the results of these tests was published in a note for the Railway Congress (session of 1899), as mentioned by Mr. Bélélubsky, and inserted in the *Compte rendu* of that session. Our object was to decide whether hard or mild steel was preferable. For this purpose we took 150 rails, some of which had been a long time in use without showing any obvious signs of deterioration, and others discarded after being a short time in service. The physical and chemical tests conducted on both convinced us that comparatively hard rails ought to be preferred. These experiments proved that steel can be very hard without being brittle. There should then be no hesitation to use hard steel, within, of course, certain limits.

I am not on the spur of the moment prepared to quote the various details on the results of these experiments; I shall confine myself to stating that the best of the rails examined were those in which the ultimate breaking strain averaged 67 kilograms (42.5 tons per sq. in.), the elongation 19 per cent. and the contraction 36.50 per cent.

We also experimented with tires, selecting, as in the case of rails, tires that had been a long time in use and others that had been little used. Although the subject of tires is not under discussion, I cannot refrain from telling you that we found soft steel not less brittle than hard steel. Lack of hardness in steel is no guarantee against fractures.

As Mr. Bélélubsky has told you, the tests carried out in Russia have caused the managements to alter their specifications. For a long time past there has been growing up a marked tendency in favor of increased hardness in rails; but as I have said it is only within certain limits.

Mr. Post.—As has been said, it must remain an open question whether to prefer hard rather than soft steel in making rails because we are not in possession of accurate data from which to draw conclusions. . . . We selected two fields for experiment under identical conditions: straight line, on the level, away from stations, consequently removed from braking. On one we used rails of soft steel, on the other hard; both kinds of rails were physically and chemically examined at the factory; consequently we know their exact composition. Over each experimental section we ran 35,000 trains; then we examined and weighed the rails and we found that those made of soft steel showed signs of greater wear than those of hard steel. This result astonished me, though at the time I was inclined to prefer hard rails.

In publishing an account of this experiment* I nev-

*See the article entitled "Recent Practice in Rails," in the *Railroad Gazette* of the 12th of October, 1900.

*See *Railroad Gazette*, 1899, p. 810.

ertheless insisted that we ought to be very cautious before coming to any definite conclusion, inasmuch as the external surface might show little wear while the condition of the interior might cause us a surprise. From the sequel you will see that I was not at fault in making this reservation. After running 65,000 more trains over each trial section, we checked things once again and what did we find? The hard rails showed greater decrease in weight than the soft rails. I am, therefore, one of those that quite rightly think it advisable to leave the question open. People seem to translate the word "hard" as equivalent to "good"; but in technical subjects we must only rely on decisive experiments.

Dr. Charles B. Dudley (Pennsylvania Railroad).—. . . Some years ago the Pennsylvania Railroad Company made quite an extended study of steel rails taken from the track and which had done service for a number of years. . . . To our surprise our studies led us to the conclusion, that both from the standpoint of freedom from breakage, and from the standpoint of long life or slow wear, the mild steel gave better results than the hard steel. Since that time, over 15 years ago, the question of wear has been constantly before us, and although no equally extended study has been made, we have seen nothing during that period, to antagonize the views expressed above. We still believe that from the standpoint of safety and from the standpoint of resistance to wear, mild steel gives better results than hard steel. If I understand the report of my namesake, it is a plea in favor of a more rigid track. Upon this point, namely, the desirability of more rigid track, we are quite ready to agree with the author of the paper, and I am glad to be able to say that I know of no one in America who has done more to bring about this desirable result, than my friend Dudley. On the other hand, I cannot but feel that there are better ways of obtaining a rigid track, than to increase the hardness of the steel. It has been generally accepted I believe for a long time, that anything which increases the brittleness of steel, increases the rate of wear, and it seems easy to understand why the more brittle a piece of steel is, the more readily it should crumble and fall away, under the forces which produce wear; so that if hard steel is by virtue of its nature a little more brittle than soft steel, it would be expected that it would wear more rapidly, which we think is the case. . . .

Mr. Coüard (Paris-Lyons-Mediterranean).—Great stress seems to be laid on the regular wear of rails; but upon the Paris-Lyons-Mediterranean we regard this point of secondary importance; what is really important is local wear, transverse fractures, cracking of rails. The proportion of rails removed on account of regular wear only amounts to 6 per cent. of the rails renewed, apart, of course, from rails laid in tunnels or taken up on account of deformation, for once a rail is untrue it is renewed if it is only worn down 4 or 5 millimeters (0.157 or 0.197 in.). . . .

The report recommends tonnage as the basis upon which wear should be judged, but that is not enough. My own opinion is that we should take the number of trains into account. There is no doubt that passenger trains, especially fast ones, which only represent a small part of the tonnage, strain the permanent way a great deal. Speed of trains ought also to be considered. An English engineer has maintained that the wear of rails is proportionate to tonnage multiplied by speed; the product is practically the same for all trains and consequently it would be more accurate to compare wear with the number of the trains. . . .

Mr. Brière (Orleans Railway).—Within the limits allowed in specifications I think there is no great difference, so far as results are concerned, between the rails you call hard and soft. I entirely agree with Mr. Coüard's observation: On the Orleans system, with its 7,000 kilometers (4,350 miles) of line, we have never discarded a rail on account of wear. What I have just said may seem paradoxical, but I am speaking before men of intelligence and experience. . . .

At special points, where owing to the action of the brakes we find rails beginning to get seriously worn, care is taken to remove them early enough and relay them between stations on lines where traffic is less heavy. This explains what I have just said, paradoxical as it sounded, that I have never removed a steel rail on account of wear upon the Orleans Railway. Wear is not there a question of capital importance, granted the limits imposed by specifications, and I may say that in my opinion the subject does not warrant the time spent in making experiments and reports.

Mr. de Werkhovsky.—Mr. Brière has told us that on the Orleans Railways they have never noticed any considerable general wear of their rails. But I think I ought to draw your attention to the fact that the rails used by that company are hard rails with a minimum tensile strength of 75 kilograms (47.6 tons per sq. in.), which is a hardness even in excess of that approved by our trials. This statement supports what I said just now to the effect that hard rails possess a considerable advantage over soft rails. If the Orleans' rails had possessed a maximum tensile strength of only 60 or 50 kilograms (38.1 or 31.7 tons per sq. in.), probably they, like us, would have found that they wore out fast. In any case, if we are to go on discussing whether hard or soft steel is preferable for manufacturing rails, it is indispensable that we should decide what steel is to be regarded as hard or soft. The degree of hardness may be judged according to the use for which such steel is intended; some steel, for instance, which would be soft for tools, is hard for rails.

Mr. Poulet.—This, gentlemen, is how I propose to word our conclusions:

"It does not seem possible to lay down definitely what kind of metal is the best to use for the manufacture of rails.

"It is advisable to continue the investigations already made with this object, laying down accurate definitions for the terms 'hard' and 'soft' steel, and adopting uniform experimental units." These conclusions were adopted.

Proper Method of Cleaning Brake Cylinders and Triple Valves on Freight Cars.

BY OTTO BEST.*

One of the most important actions taken at the last meeting of the Master Car Builders' Association was the increase of the interchange charge for cleaning triple valves and brake cylinders of air-brakes. The principal object of the Association was to allow a slight premium, in order that a greater interest might be taken in this work, as the former price did not justify railroads in cleaning the triple valves and brake cylinders of foreign cars, and it is sincerely hoped that every air-brake inspector will now put forth his best efforts in the proper maintenance of brake cylinders and triple valves.

The cleaning of triple valves and brake cylinders has not received its share of attention in the past, and the result is that we can safely say that 50 per cent. of the freight brakes of to-day is one year in arrears of cleaning. A vast sum of money has been spent in applying air-brakes to freight cars in the past five years, and yet no additional force has been employed to look after or maintain the efficiency of these brakes. The main point at issue is the safety with which we can run our freight trains, and it behooves us to add additional inspectors and repairmen that the best possible attention may be given to air-brakes. We should not relax our efforts to bring about a condition, whereby all air-brakes will be kept in good order, switched ahead and used.

All will agree that brakes deteriorate more quickly out of service than in service. Trainmen should be provided with air-brake defect cards, and when brake cylinders and triple valves are found to be one year in arrears of cleaning, they should be reported at the terminal. The inspector's attention will then be directed to this car and a special effort will be made to clean the triple valve and brake cylinder. Of course, this work cannot be done where cars are in fast trains and do not lie at terminal points. If triple valves arrive at terminals and are inoperative on account of needing cleaning, the triple may be removed and replaced with a triple that has been thoroughly cleaned and tested. This method has been adopted at all terminal points of the Nashville, Chattanooga & St. Louis Railway, and at Nashville Terminals, as it has been found necessary to remove the triple to effect the proper cleaning of triple valves.

We have found many cases where brakes were rendered inoperative from the fact that the triple valve gasket had been improperly applied and was cramped between the auxiliary reservoir and the brake cylinder tube. This could be avoided if repairmen would, when replacing the triple valve, put the gasket on the triple valve instead of on the auxiliary reservoir. By removing the triple valve the condition of the brake cylinder tube can be readily ascertained, as frequently cases of tubes stopped up are coming under our observation, which is caused by car oil being poured into the brake cylinder in large quantity through the oil plug. Triple valves should now be taken to the repair room where an experienced man is employed for this work, and who is also held directly responsible for all triple valves leaving the repair room in first class condition. The general condition would lead us to believe that some of the railroads are under the impression that the air-brake needs no attention; that after it is applied to the car it will need no care and work forever. It is a fact that the apparatus is all right as originally put up, but it will not take care of itself, was never expected to and never will.

The Nashville, Chattanooga & St. Louis Ry. and Nashville Terminals are endeavoring to take care of their own equipment, and of as many foreign cars as possible. The roads that are not looking after their own air-brakes will find eventually that allowing packing leathers to dry out and triple valves to become gummed up and inoperative, increases the cost of maintenance and that cylinders and triples should be cleaned once a year. The main object of this article is to call the attention of air-brake inspectors to the proper cleaning of the cylinders and triples, that they may do their work in a practical and systematic manner, and above all on an economical basis. This can be done if inspectors are properly instructed, and as far as practicable, experienced men should be employed and none but such men should be permitted on triple valve repairs. Inferior workmanship comes under our observation daily, and especially in the cleaning of triple valves.

Cleaning Westinghouse Triples.—The proper way to clean a Westinghouse triple valve is, first it should be dismantled. All parts, except those with rubber seat valves, should be immersed in kerosene. The kerosene softens the dirt and gum on the parts of the triple, makes the parts quite easy to clean, and also makes the triple piston packing ring work freely in its groove. Waste saturated with kerosene should now be used in cleaning the triple piston cylinder and other parts of the triple body. The feed groove should be well cleaned and great care should be taken in order not enlarge its size, as this is a very vital point; in fact, one of the most vital points pertaining to the action of the triple valve in properly charging the auxiliary reservoir. The cavity of the triple should be cleaned by using kerosene. The condition of the slide valve seat, and triple cylinder bush should now be ascertained. If the slide valve and seat need repairing or facing, great care should be taken that the slide valve is properly faced to its seat, using ground glass very sparingly in grinding the valve. Emery of any kind should never be used for grinding purposes in triple valves.

The next and most important feature is the condition of the triple piston packing ring. The ring must be a neat fit in the cylinder, as well as in the groove of the piston; the ends of the ring must not stand open to exceed $^1/_{64}$ in. When it is found that the triple piston packing ring needs renewing, or the triple bush is badly worn, our experience has been that it is much cheaper to send such triple valves to the makers, as this work cannot be satisfactorily done with our facilities. In repeated attempts to do this work we were unable to repair the triples so they would release in the prescribed test. However, if it is found that the ring is in good condition a few drops of engine oil should be put on the piston, on the slide valve and into the cylinder, and the triple piston worked back and forth in the cylinder for a minute or so, after which the parts should be thoroughly cleaned with rags, and not waste. After this a few drops of engine oil should be put on the slide valve, on the piston, into the cylinder, and the triple piston put in place. The condition of the graduating stem, spring and nut should be noted. The nut should be thoroughly cleaned out with a reamer made especially for the purpose, as the rust and dirt tend to accumulate in this nut, which, in turn, causes the graduating stem spring to stick fast in the nut. The length of graduating spring should be measured, and if it is not the standard as prescribed by the makers a new one should be applied. Next, the graduating stem should be cleaned and it should be seen that the stem works freely in the graduating nut. This is very important. The condition of the cylinder cap gasket should be noted, as the inferior oil that is being used by some railroads in their brake cylinders and triple valves tends to eventually rotten this gasket. This gasket should not be scraped with a sharp tool, but should be put in good order by rubbing briskly with a piece of cloth. The triple body is now ready for the cylinder cap, but, before applying, it should be thoroughly blown out, as dirt and rust seem to accumulate in this cap. The valve is now ready for the emergency parts. The emergency valve piston bush should be examined as to its tightness in the body. Several cases have come under our observation where the bush in question was found loose and down on the emergency valve seat. The condition of the emergency valve seat should next be noted. If the seat has been in any way distorted it should be replaced and the emergency valve piston stem should be introduced into the valve seat to see that it does not bind. It should work perfectly free. The condition of the emergency valve should now be noted. If necessary, and it is generally the case, the rubber seat should be renewed. It should also be noted that the stem is true with the body of the valve, and that it works freely in the emergency valve piston and check valve. The check valve should be ground to its seat and it must work perfectly free in its bush, or in the check valve case. The check valve spring should be measured, and if it does not comply with the standard, a new one should be applied. Much trouble has been experienced from the old check valve case on account of the cast-iron seat in the check valve case. This has been corrected by substituting brass seats.

Next is the check valve case gasket, and our experience has been that it is far cheaper to apply a new check valve case gasket than to use the old ones, as it is only a question of time until the old gaskets will blow out. After carefully noting the thread and face on the check valve case we are now ready to apply the case. Great care should be taken not to injure any of the parts in applying. Hold the case firmly to its seat until both cap screws have been brought to a bearing, then with a wrench draw on the two nuts as uniformly as possible to prevent cocking the check valve case, and causing the gasket to leak. No oil or grease of any kind should be used on the emergency parts. The valve is now ready for the test rack. Before testing the valve we will next take up the proper cleaning of a New York triple valve.

Cleaning New York Triples.—Remove the triple from the auxiliary and send to the triple valve repair room. Remove the three front cap bolts and then remove the front cap. Care should be taken not to destroy the front cap gasket. Next remove the vent valve seat to which is attached the vent valve piston. Then remove the two stop screws from the vent valve seat, take the vent valve piston from its place and immerse it in kerosene. Remove the main piston, which should also be immersed in kerosene. Remove the emergency valve cap, and then remove the quick-action valve and note its condition. If a new rubber seat is needed, it should be applied, which will be found needs renewing frequently. Next remove the check valve cap, examine the check valve seat and seat, and, if needed, grind with a little oil. Then examine the vent

*General Air-Brake Inspector Nashville, Chattanooga & St. Louis Ry. and Nashville Terminals.

valve and, if needed, renew the rubber seat. Remove the side cap bolts and the quick-action valve piston, which should be thoroughly cleaned before replacing. All the ports in the body of the valve should now be thoroughly blown out and the triple valve cylinder should be thoroughly cleaned with waste saturated with kerosene. The feed port should not be neglected. Both feed grooves should be thoroughly cleaned out. It is also important to notice the small port in the vent valve piston; it should be well cleaned, as it is very essential that this port be opened so it can perform its function. The brass plug in the vent valve piston should not be removed excepting when a new packing ring is applied; then this plug should be removed so the packing ring can be properly ground in its cylinder, using oil only for grinding. After the packing ring has been thoroughly fitted to its cylinder, the brass plug should be put back in the piston, as leaving out this plug destroys the quick-action features of the valve.

All the parts, including the slide valve body, should be thoroughly wiped out with rags. Do not use waste. The condition of the slide valve should be noted, and, if necessary, it should be faced. Care should be taken, if the exhaust slide valve has been removed for facing purposes, that in replacing the valve on the piston stem to have the small shoulder, or the end that has the exhaust port nearest the slide valve, facing the auxiliary side of the piston. The long shoulder should be next to the graduating valve. This is very important, as it will be impossible to retain air in the brake cylinder if the slide valve is put in the reverse position. The condition of the main piston packing ring should be noted. Also the condition of the vent valve piston packing ring. It should be seen that both packing rings work nicely in their grooves. Do not scrape the inside of the main piston leather. This should be cleaned with waste well saturated with kerosene.

A few drops of high-grade engine oil is used on the graduating valve, exhaust slide valve, and on the piston packing ring and vent valve piston, and the triple piston cylinder should be nicely lubricated by dipping the finger into this oil and carefully distributing the oil. Ports in the vent valve seat should be thoroughly blown out and all corrosion removed. Before replacing the vent valve seat ascertain if the vent valve piston stem is perfectly true, after which put it back into vent valve seat and hold it in place by applying the piston stop and two stop screws firmly to the seat. The guide points on the triple valve body should never be cut off or molested, as they will hold the vent valve seat in place while the front cap is being applied. The vent valve should now be examined in the same manner as the quick-action valve. It will be found that the rubber seat on the lower end needs renewing quite often, as it bears harder on the bottom than on the top. Replace the quick-action valve, using no oil on any of the rubber seats. Next replace the quick-action valve piston, noting that in forcing the quick-action valve from its side it should work quite freely. Replace the check valve. The valve is now ready for the test rack, shown in Fig. 1. The proper cleaning of other makes of triple valves should go through the same process as heretofore mentioned, but as there are few valves of other makes in use, it does not seem necessary to dwell on them.

Test for Repaired and Cleaned Triples.—In order to determine the efficiency of the triple piston packing ring in release position, a 1-in. cut-out cock is placed in the train pipe 15 ft. from the triple valve and cut-out cock, 1-in. pipe being used. Through this cut-out cock there is drilled a hole $^1/_{32}$ in. in diam. A pressure gage is located in this 15 ft. of pipe. Also pressure gages are mounted on the auxiliary reservoir and brake cylinder. To test a triple valve the 1-in. cut-out cock, with the $^1/_{32}$-in. hole, is opened. The auxiliary is now charged, the time of charging being noted, which should be as set forth by the M. C. B. code. The piston travel in the brake cylinder is 8 in. This 1-in. cut-out cock, with $^1/_{32}$-in. hole, is located at the end of a four-car train, each car having 40 ft. of train pipe. A F-6 brake valve is employed for applying and releasing the brake. A reduction of 10 lbs. is now made in the train pipe with the brake valve, which applies the four brakes, and also the fifth one, which is being tested and marked A1, or A2 in Fig. 1. After this the 1-in. cut-out cock, with the $^1/_{32}$-in. hole is closed. The engineer's brake valve is thrown to full release position, which releases the first four cars and the air must now pass through this $^1/_{32}$-in. hole, feed up the 15 ft. of 1-in. train pipe to the test triple, and if the triple piston packing ring is defective, the triple piston will not release. If in good condition it will release. The cut-out cock is then re-opened, the auxiliary charged to 70 lbs. and a full service reduction is now made, 22 lbs. The 1-in. cut-out cock, with the $^1/_{32}$-in. hole is again closed; and the engineer's brake valve thrown to the full release position. If the triple piston packing ring is defective it will not release under this pressure; if in good condition it will release. The cut-out cock, with the $^1/_{32}$-in. hole, is again opened, the auxiliary charged to 70 lbs., and the brakes are now applied in quick action. The cock with the $^1/_{32}$-in. hole is again closed, and the handle of the engineer's brake valve is thrown to full release, and the triple piston must release through the $^1/_{32}$-in. hole. If a packing ring is condemned a new one must be applied.

If the triple valve has undergone all these tests the date is stenciled with white lead on the triple body and the last initial of the inspector's name is stenciled on the cylinder cap with white lead. It will also be noted, in Fig. 1, reservoir marked B1 is used for testing plain triple valves, which are required to pass through the same test as described. It will also be seen from Fig. 1 that quite a number of triple valves are awaiting repairs, and by concentrating all of the repairs to triple valves at one point the work is systematically and economically done. Inferior workmanship is a thing of the past. The percentage of slid flat wheels has been decreased to a minimum and this method is especially commendable in winter time, as the work of cleaning triple valves is done under a great disadvantage in cold weather when snow is on the ground and inspectors are required to go under the cars to do this work.

Fig. 2 shows the test apparatus with a 12-in. brake cylinder where special passenger triples are tested. The same method of cleaning triple valves in passenger service is employed as in freight service. Triples are removed from the brake cylinders and sent to the repair room and another triple put in its place. In other words, first in, first out, on triple valves.

Inspectors and Air-Brake Repair Men at Nashville.—The repair room is located in the middle of the yard at Nashville Terminals, in which are employed one triple valve repairman and a helper, who average cleaning, repairing and testing about 35 triples per day. In the north end of the yard is located a signal tower, the first floor of which is occupied by the air-brake inspectors, where a number of repaired triples are ready for immediate use. Also extra air hose, angle cocks, cut-out cocks, pressure retaining valves, release valves and pipe nipples, of different sizes, are kept in stock. Another such room is located in the south end of the yard, which is one mile from the north end and one-half mile from the triple repair room. Between the main repair room and each end of the yard are boxes suitably made for storing repaired triples, and in which removed triples are placed. There is also a triple valve box placed on the repair tracks where triples are stored. A helper is employed who collects removed triples and brings them to the repair room. He also delivers repaired triples to the different storage places. This same helper also delivers other material, carries reports, defect cards, etc. This prevents inspectors leaving their posts of duty and running around the yard.

On the repair tracks are employed three men, one who devotes his time to repairing pipes, moving the train pipe the proper distance from the center line of cars, giving the angle cock the proper angle, which should be 20 deg., and tightening train pipes and retaining pipes to the car. He also examines and repairs brake rigging and adjusts piston travel. The other two men clean brake cylinders and remove and apply triple valves, and clean car drain cups. The latter, in my opinion, is most essential for the proper working of the triple valve, as it is a daily occurrence with us to find this drain cup and strainers stopped up with grease and dirt. When it is found impossible to clean the drain cup strainer, it is removed and boiled in lye water, and a repaired one is put in its place. This is not the case with the improved perforated sheet brass strainer.

There are employed four air-brake inspectors in the south end of the yard, two in the day time and two at night. Six inspectors are in the north end of the yard, three in the day time and three at night. This increase in the north end is on account of heavier traffic and more trains leaving that end of the yard. Besides inspecting cars leaving the yard and inspecting cars arriving in yard, these inspectors make necessary repairs to cars en route, remove defective triples and apply repaired ones; remove broken release springs and apply new ones; renew leaky or worn out packing leathers; renew broken cylinder piston heads and rods; fastening brake cylinders, reservoirs and train pipes to the car body, replacing broken release and retaining valves, leaky, or worn-out angle cocks, broken handles, air hose and air hose coupling gaskets; tightening pipe joints, and last, but not least, adjusting piston travel. This makes a total of 16 men, who are under the direct supervision of one

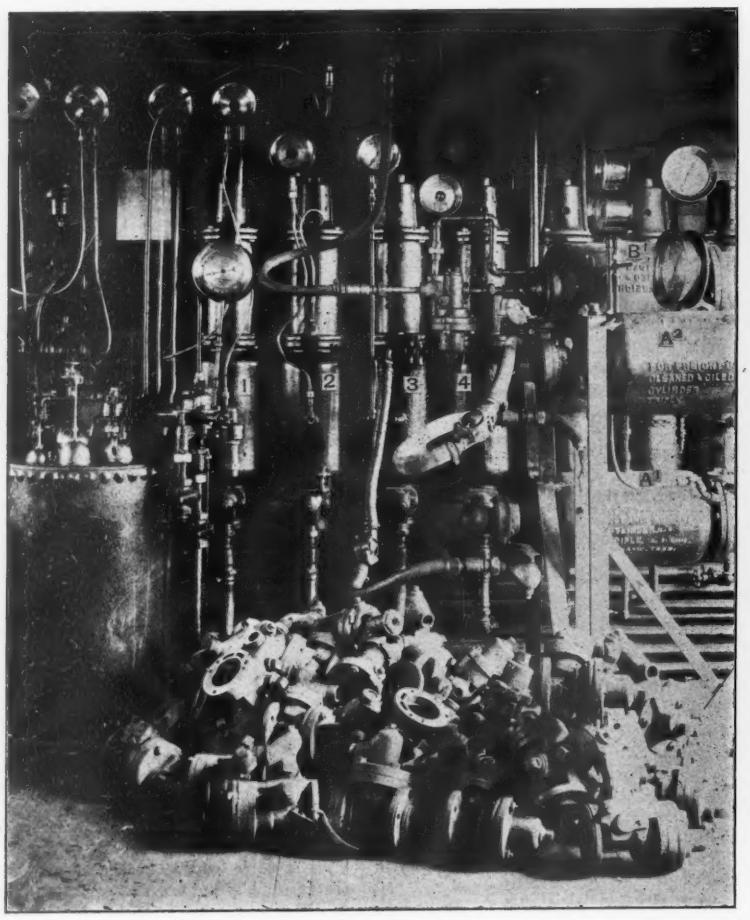


Fig. 1.—Test Rack.

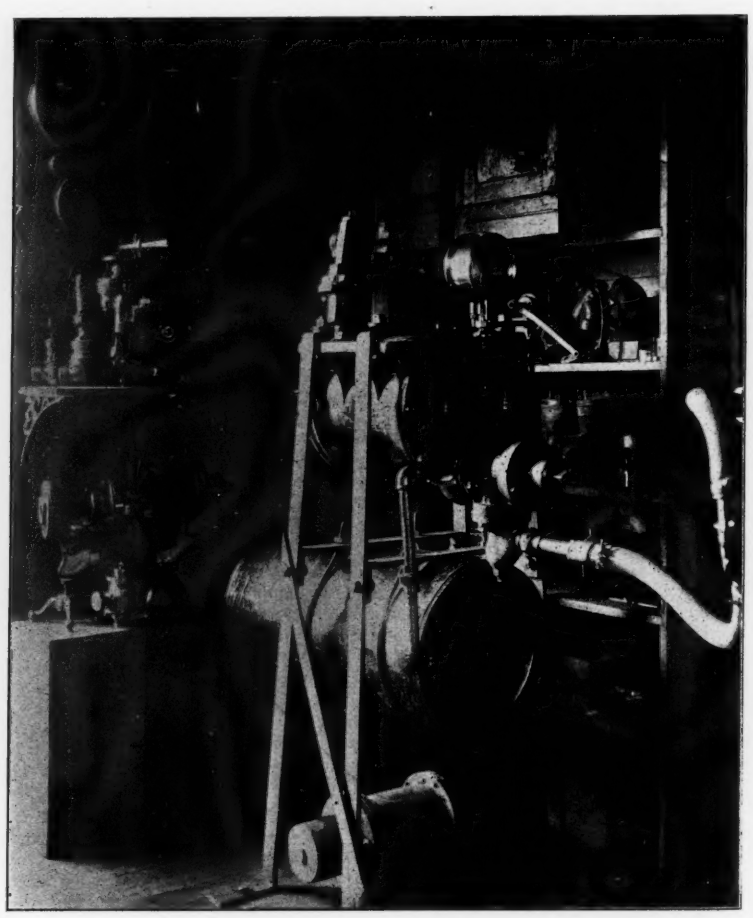


Fig. 2.—Test Apparatus for Special Passenger Triples.

Chief Air-Brake Inspector, who makes a daily report, as well as a monthly report to the General Air-Brake Inspector, in whose office all records are kept.

Cleaning Brake Cylinders.—The Master Car Builders' Rules require that brake cylinders be cleaned and oiled within 12 months of the stenciled date on the cylinder. The place and date at which the brake cylinder is cleaned should be stenciled on the reservoir with white lead, and the last initial of the inspector who cleaned the car should also be stenciled on the cylinder. While the triple valve is being removed the brake rigging on the non-pressure side should be disconnected and the cylinder cleaned. No. 1, of Fig. 3, is a clamp put on over the piston sleeve next to the non-pressure head to hold the spring in compression on Westinghouse brake cylinders. No. 4 is a pin which is used when there is a hole through the piston sleeve, as with the New York. After the clamp is applied the four non-pressure head bolts and nuts are removed. The piston is now removed. The cylinder is cleaned with waste well saturated with kerosene. The leakage groove is cleaned with a diamond-shaped tool. The brake cylinder tube is cleaned with a tool which resembles a gun barrel cleaning rod. The expander ring is now removed. The dirt and grease is removed from the piston, packing leather, follower, etc. It is well cleaned with waste saturated with kerosene, after which the condition of the packing leather is ascertained. If badly worn, or worn out, short or cut, it is removed and a new leather applied, being careful that the flesh side of the leather is put next to the walls of the cylinder. If the leather is in good condition, the follower bolts and nuts are tightened. This is very important. In tightening the follower bolts, the followers should be closely inspected for cracks; also the piston head where the sleeve is riveted to the piston. Also, if the sleeve is split it should be renewed. The packing leather and brake cylinder are now in condition for the air-brake grease, which should be used sparingly in the brake cylinder and applied with the hand to the walls.

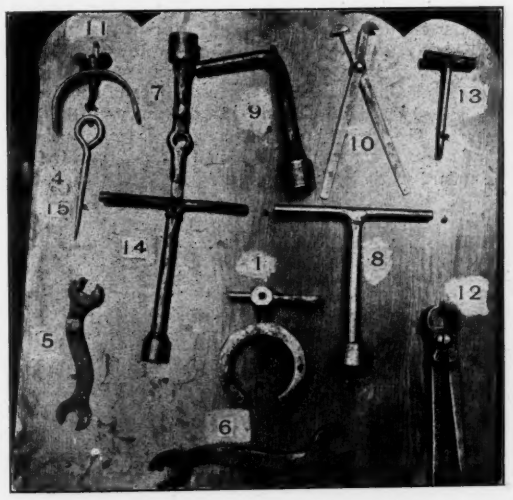


Fig. 3.—Convenient Tools.

The grease should be well worked into the packing leather and used sparingly between the follower and leather. In replacing the piston in cylinder great care should be taken that the expanding ring is kept between the follower and the leather, and not allowed to get out. Enter the piston in the cylinder at an angle of 45 deg. with the cylinder sleeve, pointing downward. The opening of the expander ring, when put in the piston, should be on top. Raise the piston sleeve gradually, at the same time working the leather into the cylinder and keeping the expander in place. When the piston is in place give it one-fourth of a turn in the cylinder, which brings the opening of the expanding ring to the side of the cylinder. If the leakage groove is cut in the side of the cylinder the opening of the expanding ring should be on the opposite side. No sharp tool of any description should be used in putting in leathers. Many cases have come under our observation where chisels have been used, or other sharp tools, where the tool had cut through the leather. It has been found where the opening of the expanding ring is put at the top of the cylinder it will leave a small fold, which gets into the leakage groove and destroys its efficiency. When the opening of the expander is put at the bottom of the cylinder, we find that the expanding rings will not stay in place.

The four non-pressure cylinder head bolts are now replaced and well tightened. The pressure cylinder head bolts between auxiliary reservoirs and brake cylinders are tightened before the brake cylinder and reservoir are tightened to the car body; also blocks. The triple valve is now replaced, but let me call attention again to the fact that the gasket should be applied to the triple valve and not to the auxiliary. Here, it may be said, that we keep three extra scrap pistons with leathers applied in extra scrap cylinders, which shapes the leather to the cylinder so that it can be easily applied. It has been found that best results are obtained where leather gaskets are used on branch pipe unions and on train pipe unions.

The brake rigging on the non-pressure side is now replaced, and pressure is admitted. Great care should be taken that proper pins and cotter keys are used in the brake rigging as prescribed by the M. C. B. rules. The brakes should then be tested with air to see that all pipe joints are tight, brake cylinder leather tight, cylinder gasket, release valve, etc. Brakes should be applied, piston travel adjusted, and the retainer should be turned up to see that all pipe joints are absolutely tight between the triple and retainer. Brake cylinders should now be stenciled with white lead, as before stated, and if a foreign car, a repair card should be attached as prescribed by the rules. The inspector keeps a record of all work done, and each morning turns in this report to the General Air-Brake Inspector to be entered in his record book. The General Air-Brake Inspector makes a monthly statement, giving the initials and numbers of all cars and the triple valves cleaned and oiled during the month. At the terminal points on the Nashville, Chattanooga & St. Louis this system is in operation, at Atlanta, Chattanooga, Memphis, Paducah, as well as Nashville terminals and Nashville shops.

Referring to Fig. 3, No. 5 is an open end wrench with one end that fits a ½-in. cap screw on the check valve case; the other end fits the nuts of the cylinder cap nuts on the drain cap. No. 6 is an open-end wrench, one end of which fits the nut on reservoir stud for removing and applying triple valve to reservoir. The other end is to remove the drain plug in the bottom of the auxiliary, and drain plug in the bottom of the check valve case. No. 7 is a socket wrench for tightening nuts on the triple cylinder cap. Also used for tightening lag screws to hold pipe clamps and retainers. No. 8 is a socket wrench with a T-handle, used by triple valve repairmen for tightening cylinder cap nuts. No. 9 is used for tightening auxiliary reservoir and brake cylinder iron plates to steel body cars. No. 10 is a tool for removing the emergency valve seat when stuck in triple valve body. No. 11 is a tool for removing the emergency valve seats when stuck in check valve case. No. 12 are tongs for removing triple valve pistons, and this tool is especially handy when the triple is stuck in triple cylinder. No. 13 is a tool used for removing the main pistons of the New York triple valve. No. 14 is a socket wrench with T-handle for removing graduating valve seat from the body of a plain New York triple, plate IV, catalogue 1891. No. 15 is a tool with a diamond point for cleaning feed grooves in brake cylinders.

In conclusion it may be said that the methods described have given most excellent results. There is no question but that the work of cleaning triple valves can be done much cheaper and better under this system than when they are cleaned under the car. I am quite confident that the new price will not only act as a premium to every road to do its own cleaning, to save paying a profitable price to others, but it will be the means of other roads endeavoring to clean as many foreign cars as possible. We, however, will not be profited unless the work is done as herein described. If the work is slighted no good will be obtained and the general poor condition of triple valves and brake cylinders will not be improved.

Freight Yards as Seen by a German.

There appeared some months ago in the *Organ* a discussion by Mr. Blum of the principles of freight yards. This has been abstracted for the Institution of Civil Engineers as below:

Goods traffic is divided, for marshalling purposes, into long-distance traffic (coal, ores, etc.), express goods (trains stopping at important junctions only) and local goods. Sorting-sidings are of three classes, according as they are arranged, for—(1) local traffic only; (2) local and express goods; (3) all three kinds of traffic.

There are three distinct methods of sorting wagons. (1) Repeated hauling forward and shunting back of the whole goods train, detaching wagons as required. (2) Shunting from upper reception lines through successive gridirons to the lower reception and depature lines by means of gravitation. This is a comparatively modern method, and is further divided into two kinds, according as (2*a*) the sidings are laid on one inclination from end to end, or (2*b*) the whole fall is divided into steps formed by nearly level lengths with short portions on a rapidly falling gradient. (3) Shunting by means of an engine on the next road to that occupied by the train, pulling or pushing separate wagons from the train. This method is in use in America, but not on European railroads.

The author enters into considerable detail as to the arrangement of sorting sidings. The general type recommended may be described thus:

Starting at the head of the yard, there are first the reception-lines, serving also as the lines from which the shunting is begun, then the sidings into which the wagons are sent according to the nature of the traffic (long-distance, express or local), then the gridirons for marshalling according to district and station order, and finally the collecting and departure lines for the made-up trains.

To enable the wagons to run the whole length required, the author recommends that the sidings themselves be laid out on a very flat gradient, but that towards the end of one group of sidings and the entrance to the next there should be a short length of 1 in 200 rising, followed by a falling gradient of 1 in 40 of such a length as to impart to the wagons, by the time they reach the foot, such an impetus as will carry them to the far end of the next group of sidings in the most unfavorable conditions of weather. Such an arrangement means the necessity of some means of braking the wagons, which on German railroads are not provided with hand-brakes.

The use of scotch-blocks and brake-sticks requires a considerable number of men and consequent expense. A means of economizing in this direction is the use of a movable brake-rail at the foot of the 1 in 40 gradient, so as to modify the starting speed of the wagons as required. At Speldorf the adoption of this method reduced the number of men required to attend to the braking of the wagons from 11 to 7.

The author also describes the various systems of communication between the men in the reception lines and the pointsmen—the original hand signalling and calling out, the use of disks and levers on posts to indicate numbers, Othegraven's electrical method, and communication by telephone.

At the sorting sidings at Brockau about 32 trains, averaging 60 wagons each, are dealt with every 24 hours. It was sought to reduce the expense involved in the ordinary methods of working, and after some preliminary experiments, a system by which the number of men employed was considerably reduced was arranged, and has given entire satisfaction in actual working. This consists simply in substituting telephonic communication for shouting, the use of recognized gestures, shifting the colored lenses of handlamps, etc. There are at least two sets of apparatus, one in the shunting-necks or reception lines and the other at the head of the sorting sidings. Each set of apparatus consists of a loud-speaking, receiving telephone, microphone transmitter, induction-coil, battery, bell, etc., all contained in or attached to a cast-iron housing.

English and American Bridge Work.

Under the above title Mr. John Graham, M. Inst. C. E., Bridge Engineer of the Great Indian Peninsula Railway, of India, writes from Bombay a letter which appears in the *Engineer* (London) of Aug. 2. The whole letter is very well worth reading from its liberality of spirit and comprehensiveness of knowledge. Below are a few extracts from the letter:

"We may take it as an absolute truism that no British Colony, Government, or firm would place an order in America if they could place it on equally favorable terms in Great Britain. Two entirely different systems of competition have hitherto existed in the two countries. In America there has been always competition in design, price and time of delivery. In England competition in price only. It is the narrowness of the English method of competition which is responsible for the present state of things. Had our competitions in the past been as keen in design and promptness as they have been in price we would be holding our own at the present time against the world. Even now in only one direction have we much to fear, if we make up our minds to get export bridge work, and that is the enormous natural resources for the economical production of steel; this, according to Sir Lowthian Bell, is not very serious, but it must not be overlooked that such things as the recent absurdly inflated prices of coal do not assist us.

"Much is being said about the consulting engineer to the effect that he blocks the way; that nothing can be done whilst the present system exists, etc. Those who say this have but the smallest idea of the reality of our great railroad consulting engineers, and the enormous volume and variety of materials which have to pass under their control. That they do call for tenders for bridges to designs fixed upon by themselves is mainly due to the fact that past experience has indicated that little or no reliance is to be placed upon the designs which manufacturers are competent to submit; the case usually being that after waiting a quite unreasonable time for competition designs and tenders, they are submitted in such an irregular manner, show such absence of knowledge of bridge design, that the time lost in investigating them would be sufficient to prepare half a dozen satisfactory productions. Some of the designs which emanate from our consulting engineers' office are very adversely criticised, and frequently not without justification, for, without doubt, many of them do display lavishness and prodigality of work and material, though others are equally modern, economical, and up to date. This, however, is more the concern of the shareholders in the railroad than that of any one else.

"Bridgework of the foregoing description will be available for our bridge manufacturers for probably many years to come, especially when supported by the stipulation that "only British manufacture will be accepted." It has a highly respectable, good old Tory, crusted port flavor about it. It is never made in a hurry; there is not bustle; it goes through a period of elaborate drawings, invitations for tenders and formal acceptance, and arrives in the bridge works, where it stays so long on hand that the staff get quite a fondness for it, and it is often with a sigh of regret that they see the spans which have meandered through their drawing offices, template rooms, shops, been erected temporarily and become a conspicuous object in the landscape, taken down and disappear.

"Bridge builders who intend to enter the lists against their American competitors will have to be daring men, for the capital involved will be large, and the probability of return small, whilst the labor will be considerable, and a long period for development, which ought to have been started years ago, will be required before we can be in full swing. Two preliminary things are essential, first an English standard of live loads;

that is to say, typical engine and axle loads for broad gage, narrow gage, and meter gage, and these should be subdivided into maximum mean and maximum loads.

"With the data supplied in the foregoing, our bridge builders would be in a position to standardize and evolve their special designs. They would require to retain the services of a bridge expert—as their American competitors do—the qualifications of such an expert are not abstruse mathematical lore and ability to demonstrate all over a piece of paper the stresses in an indeterminate structure, etc., but a man who, in half an hour, can give a reliable opinion founded on actual experience, design, and research, whether the most suitable girder shall be polygonal framed or rectangular; whether it shall have five panels or six, or whatever number is best; whether one-eighth of the span or one-twelfth of the span is the most desirable depth, and a score of other similar queries. He should, from given information as to foundations, strata, local productions, etc., be able to clearly advise as to the best description of piers—steel, cast iron, or masonry—and to state from experience, based upon practical investigation, what is the most economical number of spans and piers to adopt in a bridge of given length. Dozens of books on graphic statics are written, though an intelligent draughtsman could be taught all the graphic statics necessary to take out the stresses in any girder in a week; but on such subjects as the foregoing there is the greatest dearth of trustworthy information. Next, most radical changes in our drawing-office system are demanded. A reference to the dates in the Atbara particulars indicates that about 10 days were taken up in the drawing-office and 27 in the works, indicating that the work was almost made in the drawing office, and this is how it should be. For the work for which we are now fighting a much higher qualified and better paid class of draughtsmen is essential—men with energy and *esprit de corps*.

80,000 Lbs. Capacity Drop Bottom Coal Car—Pittsburgh Coal Co.

Five hundred 35-ft. drop-bottom coal cars of 80,000 lbs. capacity are being built by the Illinois Car & Equipment Co. for the Pittsburgh Coal Co. The design is here illustrated from drawings furnished by Mr. J. E. Simons, Superintendent of Rolling Stock and Machinery. The feature of the car is at the brake-staff end of the car body, where 5-in. Z bars ½ in. thick are used at the first pair of side stakes and 6 in. of additional width is thus gained in the remainder of the car body. The 3-in. offset which is made in the side plank by the introduction of these Z bars is about equal to the projection of the side handholds, and from these first side stakes to the brake end the car is therefore 6 in. narrower than in the rest of its length. This is made clear in the accompanying illustrations.

The general construction is along recognized lines of good practice and attention is therefore especially directed to the end work, the arrangement of which is as follows: The side plank is 2½ x 10 in. and extends at one end of the car flush with the outside of the end plank. On the brake end of the car, the side plank extends 2½ in. over the first stake and short plank extends from this stake to the end. Each side of the car has nine stakes, spaced 3 ft. 8 in., center to center, except the two stakes nearest to the middle stake, which are spaced 3 ft. 3 in. from the center of the car. The stakes are of white oak, four of them being 4 in. wide x 3 in. thick at the top and tapering to a thickness of 5¾ in. at the top of the side sill. Six of them are ¾ in. narrower and have a plate of ⅜-in. steel on each side, the composite stake being fastened together with nine ½-in. bolts for short stakes and eleven ½-in. bolts for long stakes.

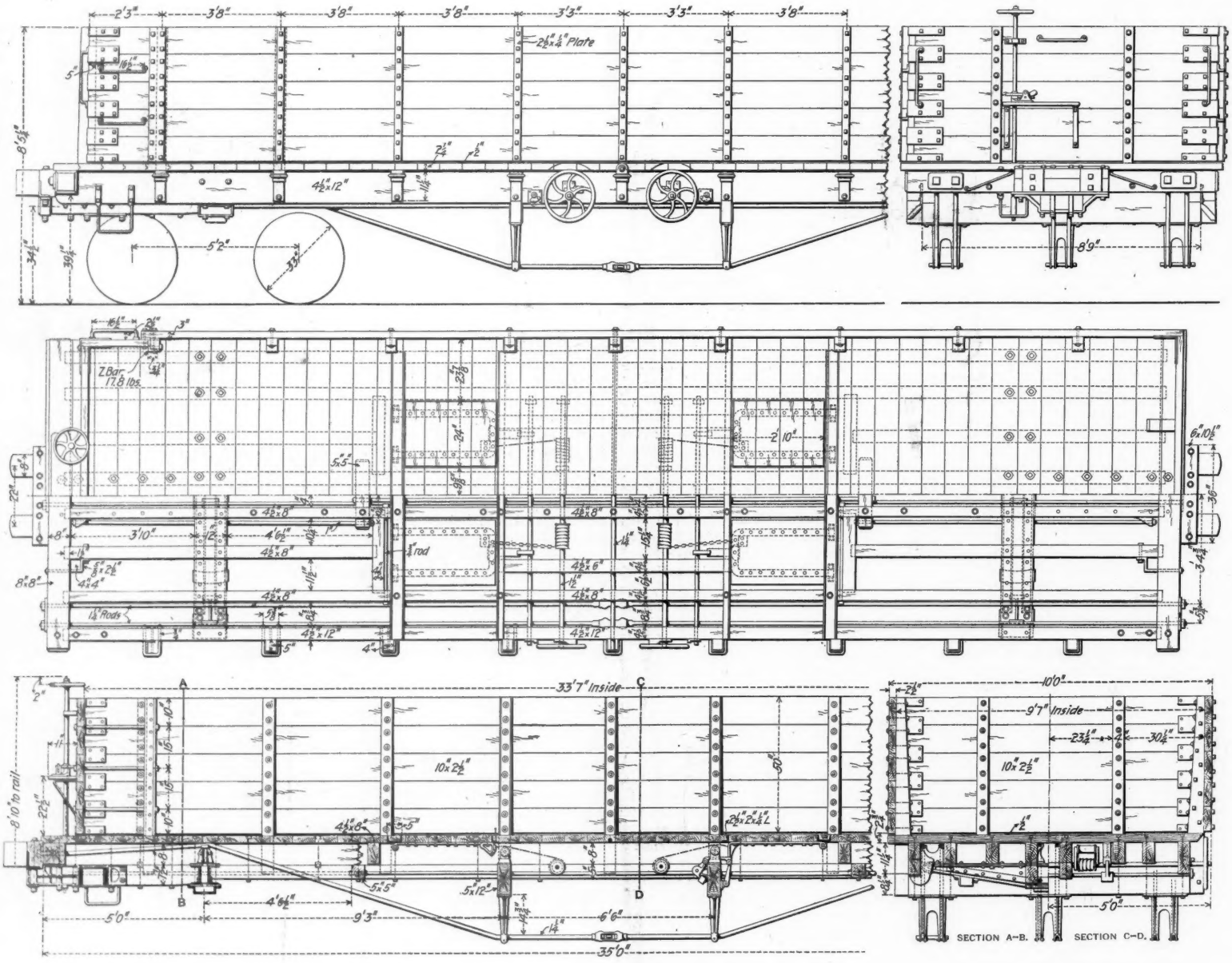
At the brake end of the car, the first stake from the end on each side has a 5-in. Z bar weighing 17.8 lbs. per foot, secured to the stake by bolts through the stake and side plank and by six ½-in. bolts across the stake. The Z bar extends to the bottom of the stake and has the outer flange cut off below the floor line, while the stake is reduced in size to receive the Z bar, as shown in the illustration. The joint in the side planks at this point is made by two ½-in. bolts passing through the ends of each plank and Z bar, and the ¼-in. strap on the outside of the side plank is extended to receive these bolts. Three ⅝-in. tie bolts pass through the stake and the end plank and are secured by nuts on the outside of each 6-in. corner band. A plate washer is used under the head of each bolt, next to the stake. Each side plank is secured to each stake by two ½-in. bolts, the heads of which are inside and have washers against the stake, and the nut end is outward, giving a bearing for the nut against the ¼-in. strap on the outside of the car.

The body of the car is five planks high. There are two white oak end stakes at each end of the car, 4 in. wide x 3 in. thick at top and tapering to 4 in. thick at the top of the sill. They are secured to the floor frame with a wrought iron pocket of ⅝ in. x 2½ in. iron, one side of which is bolted to the inside intermediate floor timber with a ¾-in. bolt. The other side is made into a ¾-in. round end threaded, which passes through the end sill and has a nut on the outside with a plate washer under it. Each corner of the car body has six inside and outside malleable corner irons. The top and bottom plates are 3 in. wide and the middle plate 6 in. wide. The corner irons extend 11 in. on the side of the car and 13 in. on the end.

The general dimensions are: Length over end sills, 35 ft.; length inside of box, 33 ft. 7 in.; width over side sills, 8 ft. 9 in.; width inside of box, 9 ft. 7 in.; height from top of rail to top of box, 8 ft. 5¼ in.; height from top of rail to bottom of sills at ends, 3 ft. 3¼ in.; height from top of rail to bottom of sills at center, 3 ft. 4½ in.; height from top of rail to top of floor at center, 4 ft. 2¾ in.; height of box inside, 4 ft. 2½ in.; length of drop door openings, clear, 2 ft. 10 in.; and clear width of drop door openings, 2 ft. From the foregoing it may be noted that the body of the car has 1¼-in. camber at the center, measuring from a line drawn across the bottoms of the end sills. The drop doors are the Simons' improved, flush with the floor and are operated by hand-wheel, shaft, and chain, as shown.

The truck is of the diamond pattern and the body and truck bolsters are of pressed steel, as made by the Pressed Steel Car Co. The journal boxes are M. C. B. standard for 80,000 lbs. capacity, malleable iron with McCord lid and the Harrison dust guard. Four hundred and seventy-five cars will have Damascus Bronze Co.'s journal bearings; 10 cars will have bearings furnished by the National Railway Specialty Co., and 15 cars will have Lumen Bronze bearings made by the Bierbaum & Merrick Metal Co. The axles are open-hearth steel made to M. C. B. standard sizes for 80,000 lbs. capacity, the chemical specifications being, carbon not to exceed .40, manganese .50, silicon .05, phosphorous .05 and sulphur .04. The physical test to which the specimen axles are subjected prescribes five blows of a 1,640-lb. weight with 40 ft. drop, the axle to show no crack or break, and passing this test the others are inspected for surface indications. The wheels are cast iron, according to specifications recommended by the M. C. B. Association, and are pressed on the axles at not less than 30 tons or more than 40 tons pressure. Tower couplers and Miner draft rigging are used.

The Westinghouse air-brakes applied to all wheels and arranged to be operated by hand from one end of the car only will be used, and a pressure retaining valve will be placed on the brake end of each car near the brake shaft. The brakes are inside hung, and National hollow brake-beams mounted with heads to take the M. C. B. standard Christie shoe are used.



80,000-Lbs. Capacity Drop-Bottom Coal Car—Pittsburgh Coal Company.

Electrifying the Metropolitan of London.

The contest over the control of the Metropolitan of London, and over the method of electrifying appears to be still going on. At the half yearly meeting of the Metropolitan Railway, the Chairman said that the directors recognized that they must look to electric traction for the restoration of their traffic and of the earning power of their road. The directors have a large personal interest in the matter and are anxious that not a day should be lost. The Boards of the Metropolitan District and the Metropolitan opened negotiations with Ganz & Co., but about this time the influence of the Americans came in to stop that part of the scheme. The directors of the Metropolitan adhered to the Ganz system and offered to help the Metropolitan District to raise money independently of the American company. The District Company, however, applied to Parliament for powers to force its system upon the Metropolitan and the latter felt bound to fight. The Metropolitan asked for an independent tribunal to inquire into and settle the system to be adopted by both companies which tribunal they had got. Whatever the decision of this tribunal the Metropolitan will likely accept it and go to work with the District Company to carry the recommendations of the tribunal into effect. At least, this is the brief statement of the Metropolitan side. Mr. Yerkes and the District people do not put it in just this way.

Air versus Water.*

BY JOHN F. O'ROURKE, M. AM. SOC. C. E.

. . . There is a general impression that what is known as a quick-sand, possesses certain mobile qualities which cause it to flow and from which it derives all its dangerous characteristics. Such a thing as a quick-sand proper does not exist. Quick-sand is simply sand surcharged with water, the tendency of the water being to flow to a lower level when unconfined, the sand flowing with it; so that the quick-sand is really sand and water mixed, and this same sand without the water possesses no fluidity whatever and differs in nothing but fineness from ordinary sand. It can be said that all sand is quick-sand if the head of water is sufficient to cause a flow. . . . It being clear, then, that quick-sand is merely a consequence of the water upon sand, it is plain that in any devices that may be adopted to deal with the difficulties that may be encountered in operations involving excavation in such material, it is the water and not the sand which we have to fight. The function of tongue and grooved sheet-piling is to prevent the flow of water through the sides of an excavation, but, as we have seen, a point may be reached when the water will flow under the sheet-piling bringing the sand with it as fast as it can be taken out. Other methods are employed, such as freezing, sinking drive wells in the ground to lower the water level; anything to get rid of the action of the water. These methods have all their limitations, and the one great and practically certain means of penetrating below the water level is the use of compressed air, which brings us to the title of our lecture.

The use of compressed air is limited to pressures of about 50 lbs. to the square inch, since man cannot work under a higher pressure than that for any period of time which would be practical, which limits the immersion to about 110 ft. Where foundations have to be taken down deeper than that still other means must be resorted to, as in the case of the Poughkeepsie Bridge, where 130 ft. below water was reached by means of large cribs through which the material underneath was excavated by dredging, and which, when undermined in that way, were finally landed on hard bottom. It is sufficient to say now, that after compressed air limits are reached, there are other means of accomplishing the work: "Machinery against Water," a most fascinating subject to go into, but which we must deny ourselves at this time. In most cases, however, air is sufficient for the purpose sought, and very few engineering operations are likely to be undertaken where the use of air is not sufficient for the purpose.

Pneumatic caissons were first used for founding the piers of bridges, but as modern developments in buildings brought them to great heights, concentrating great loads on their foundations, pneumatic caissons have become quite common under them, wherever the soil beneath was unstable for a depth, requiring the use of compressed air to penetrate. The general principles of design and operation are the same for bridges and buildings, the difference in sinking caissons in the latter case being largely due to the greater care required because of the danger to adjoining streets and buildings, and the difficulties involved in the smaller size and the higher loading per square foot of base permitted and employed. Excavation to water level is usually done in caissons before the air is turned on and one has a chance to see the quick-sand act just as it is entered. At that time the bottom is a mire into which the men sink half to the knees, and sometimes have to be pulled out of their boots before they can move. Fifteen minutes after the compressed air has been turned on, this same material is dry and firm and however fast the caisson goes down, it is not likely that water will be seen again, . . . what was a quick-sand before, is now a dry, fine sand with a plentiful proportion of mica, one of the most favorable materials existing in which to excavate.

The operation of sinking the caissons usually consists of digging in the middle of the air-chamber, working the hole out towards the cutting edge until the support under the latter is weakened and the caisson drops of its own weight into the hole so prepared. This hole is inside the outside line of the caisson which thus cuts a hole of its own size as it goes down and takes the place of the excavated material in sustaining the adjoining earth and buildings. After a caisson has been carried down for a considerable distance, it is very difficult to pile on enough ballast to make it follow down with the excavation, so that it is common to release the air pressure for a fraction of a minute, during which time the caisson falls as far as the excavation beneath allows, which sometimes is as much as 5 ft. The operation is not always dangerous when it is done quickly and the caisson is of sufficient strength to stand the new pressures that immediately act when the air pressure is removed from within, but one can readily imagine very serious consequences if attempted otherwise, or by people who are not able to judge when it is safe to try it. As a consequence, most specifications for pneumatic caisson work have a clause which forbids "blowing off the caisson," which has one very important result—that is, if a contractor meets with disaster in doing so, the engineers can say with great justice, that, if he had followed the specifications, nothing of the sort would have happened.

Passing from the general subject and coming down to particulars, I will quickly run over three or four works where caissons were used, and give you some idea of both the caissons and the work itself.

We will first take up the caissons of the Gillender Building, as they are what might be called transitionary, being built identical in design and structure with those used for bridges. These caissons are about 25 ft. in length, 12 ft. wide in ca e of the two outer ones and 15 ft. for the other, and they extend about 50 ft. below the curb. They are built of heavy timber walls in the air-chamber, the cofferdam above the air-chamber being made of planking with brick piers resting upon the roof of the air-chamber the entire size of the space inside the cofferdam. The sinking of these caissons was accomplished without any particular difficulty, the trouble arising after the caissons were sunk in getting the cantilevers in place; the material was found to be a very lively quick-sand, and more time and expense were involved in getting the excavation made for them which was larger than the caissons, and was done with the aid of sheet-piling driven by a pile-driver, than the caisson work itself cost. The adjoining buildings were supported on 16-in. steel cylinders, sunk to the hard-pan by means of jets and hydraulic jacks, the interior being afterwards filled with concrete. In placing this concrete, a small dumping bucket was used, which allowed the concrete to escape to the bottom, when bottom was reached. But this acted so much like a piston and seemed to scour the cement so greatly, that we devised a much simpler way of doing it, which was to put the concrete in paper bags and dropping them into the pipe which was filled with water. The paper bag held together until it reached bottom, when it broke. There was a gush of air through the water and that was all, the cement not appearing on the surface in anything more than a trace.

The next building we will take up is the Sohmer Building on Fifth avenue and Twenty-second street. Nine of the caissons here were made of wood, as in the case of the Gillender Building, and five were of steel, cylindrical in form. . . . The 14 caissons were sunk in 27 days, which at the time was considered a very rapid operation.

The next work we will turn to is the foundations for a residence built by Mrs. Elliot F. Shepard on East Sixty-second street, where caissons were necessary because of the site having been formerly an old pond which was filled in with rocks, the ground underneath the rocks being mud and clay, and through which the caissons were all taken to solid rock, about 50 ft. below the curb. The problem presented to me for this building by the architect was that some means should be found of reducing the cost of pneumatic caisson work, as his client did not feel disposed to go in for any such expense as the ordinary steel caissons would cost. The caissons for the Sohmer building were some of them steel and some of them of wood, and as no advantage was found in the case of steel, after much thought on the subject, I devised the wooden stave caissons, which since have been used with so much success. The ground, as I have already told you, had been filled with rocks through the water, and as a result, a great deal of blasting was resorted to in these caissons. One caisson had in the neighborhood of 40 blasts fired in it, each hole being charged with half a stick of dynamite, and the pieces of rock that were thrown against the sides, in some cases weighed 200 to 300 lbs. The only effect they produced was a light indentation, less than ½ in. in depth, the ground outside and around the caisson backing up the timber in such a manner that the 3½-in. thickness of wood offered as effective a resistance as if it had been 3½ ft.

The next building is the McCready building, on the corner of Twenty-first street and Fifth avenue. Here the conditions involved were very difficult. A building about 50 ft. in frontage, 100 ft. deep and 10 stories in height, had been erected upon a clay bottom that was of such a yielding character that there was a comparatively uniform settlement of the old building amounting to several inches. The owners of the building, who were also the owners of the adjoining corner lot of similar size, desired to extend the building, so as to have a new building of twice the size and so designed as to conform to the one already built in such a manner as to make it appear like one large building. It was at first intended to build upon footings of concrete and steel beams, or as it is called "to float the building"; but this was finally abandoned, and I was given the contract to put in pneumatic caissons. They were all ready to go on with building operations when they came to this conclusion, and as a result great haste was necessary in order to have the building ready on time, as the greater part of the floors had already been rented. I was informed of the acceptance of my bid one evening about 5 o'clock by telephone, and the next morning teams were already hauling the plant there. Three days after receiving the order, enough material for several caissons had been delivered at the lumber yard, the staves were already dressed, and in about a week after receipt of the order, the plant had been erected and the first caisson was on the ground and being sunk. This would not have been possible, if steel caissons had to be used. . . .

The caissons that abutted on the adjoining buildings were made with the cutting edge oblique to the axis, the deeper side being set against the adjoining building, and the escaping air coming up under the high edge away from it, and not disturbing the foundations. This was especially important, because of the manner in which this adjoining building had been constructed and the serious difficulties that would have been encountered, had shoring been resorted to. . . .

The last case in which these caissons were used, was at the Atlantic Mutual Insurance Co. building on the southwest corner of Wall and William streets. This building required 42 caissons, and the adjoining buildings were on a very treacherous quicksand. . . . It was considered a very risky operation to put them down without first supporting the adjoining buildings on cylinders, and I was not encouraged by people familiar with sinking pneumatic caissons under such conditions; none of them having ever done work that way, gave my plans their approval. As a matter of fact, without any exception whatever that I am aware of, all expected trouble. No trouble followed. The caissons next to the adjoining walls were built with greater amount of obliquity of cutting edge than ever before, the larger caissons having a difference of level between the inner and outer sides of 14 in., and the caissons themselves were made stronger than any heretofore built. The amount of grease with which the staves were lubricated was as great as they could be made to bear.

The real test was with the caisson adjoining the front corner of the 10-story granite building of the United States Trust Co., the first caisson sunk against the adjoining walls. It required twice as much ballast to sink it as similar caissons with the cutting edge at right angles to the axis. Again, the ground all around the caisson was perfectly hard as shown by testing it with the bar, except at a point in front of the highest cutting edge, which was so soft that the bar could be pushed in its full length, due to the escaping compressed air, churning of the water in the ground there. The most satisfactory demonstration of all, that it could be safely done, was, however, in the fact that there was never the least appearance of disturbance of foundations discovered in the adjoining building. . . .

I was so satisfied of the certainty of the means employed to produce the desired results, that at 10:30 p. m. of June 26, one-half hour after the air had been turned on in this caisson, things were going so smoothly and rapidly, that I went home to a good night's sleep. When I reached there next morning about 6 o'clock, the caisson was more than 20 ft. below the foundations of the adjoining building, which remained unmoved. . . .

The third and latest work of this sort is for the New York Stock Exchange building, George B. Post, Esq., architect, the work of which will be begun after the building has been torn down next May. The contract for doing that work has been made with me, and I have devised an entirely novel method for carrying it out. This property is 21,000 sq. ft., about one-third larger than the Mutual Life Insurance Co.'s work, and the immersion will be about 42 ft., or three times that of the Commercial Cable building. It is interesting to see that we are advancing in terms of 14 ft. in our immersions. First, the Commercial Cable building with 14 ft., then the Mutual Life Insurance Co., with twice 14 ft., followed by the New York Stock Exchange with three times 14 ft. If the rule is not broken the next job will have an immersion of 56 ft., and as solid rock will be the bottom there for the first time in the three, the water developments may encourage even greater depths.

I told the architect that I would make a continuous masonry dam. . . . My experience with circular wooden caissons and also with the square wooden ones at Twenty-second street made it plain that wood was the proper material to use. It is smoother, stronger within the limits in which steel would be employed, and more pliable in the sense that it can be adapted better to the desired uses; and a fact perhaps just as important as any, it is always within your command as to supply, which is not the case with steel. . . .

The caissons will be filled with concrete above the roof with a well at each end of the caisson, the roof underneath being removable. The ends of the caissons where they abut on each other, will be made removable in sections from the cutting edge to the top, by filling which with concrete masonry is made continuous.

*From a lecture delivered before the College of Civil Engineering of Cornell University and printed in the *Transactions* of the Association of Civil Engineers of Cornell University.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

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Mr. Quereau, in discussing the report of the Master Mechanics' Committee on "An Up-to-Date Round-House," took occasion to call in question the generally accepted opinion which approves the use of hot water in washing locomotive boilers. He said in substance that the temperature of a boiler under steam, at working pressure, is about 365 degrees, while the hot water used in washing could not be properly handled if its temperature exceeded 120 degrees. Accepting these limits, the first of which is somewhat low, the difference between the initial temperature of the boiler and that of the water used in washing, is very great, even when hot water is available, being for the conditions assumed, 245 degrees. On the other hand, the average temperature of cold water used in washing is approximately 50 degrees, which, when compared with the initial temperature of the boiler, gives a difference of 315 degrees; a difference so little in excess of that which prevails when hot water is employed, that the added injury to the boiler incident to the use of cold water could not be great. From these considerations, Mr. Quereau felt satisfied that there was no urgent need for hot water in washing, and, all things considered, he doubted if its use was justified. A closer examination of Mr. Quereau's statement shows it to be somewhat misleading. While it is true that a boiler under 150 lbs. gage pressure has a temperature of 365 degrees, it is not true that a boiler open for washing can have any such temperature. The process of blowing the steam from the boiler is necessarily a cooling process. When the process of blowing has reduced the pressure to 100 lbs., the temperature of the water in the boiler and, consequently, of the boiler itself, has fallen 27 degrees. A further reduction in pressure to 50 lbs. reduces the temperature to less than 300 degrees and, finally, when the gage pressure becomes zero, the water in the boiler cannot have a temperature greater than 212 degrees. If it were hotter than this, the boiling would continue and more steam would be generated. Even if the blow-off cocks are opened before the steam pressure is reduced to that of the atmosphere, it is reasonably certain that by the time the wash plugs are removed, no part of the boiler is hotter than boiling water at atmospheric pressure. Accepting now Mr. Quereau's figures for the temperature of water used in washing, we have a difference of temperature between the water and the metal of the boiler, when cold water is used, of 162 degrees, and when hot water is used, of but 92 degrees. From these considerations, it would appear that by using hot wash water instead of cold, the cooling effect of the wash stream can be reduced nearly one-half.

An Engineer Committee on Rail Sections.

The members of the American Society of Civil Engineers are asked to vote on the appointment of a committee to consider (among other things), a possible modification of the American Society rail sections. It will be the duty of this committee to ascertain whether or not any changes are desirable in the disposition of the metal in that admirable series of sections. As the reader well knows, the process of appointing an engineering committee in the Society is somewhat slow and complex, but perhaps no more so than is desirable. It has the good result of checking hasty and ill-considered action in a matter so important.

In this special instance the process has advanced to next to the last stage; that is, the letter ballot has been sent out. It should be carefully noted that the measure must receive a majority of a total vote of not less than one-third of the corporate members of the Society; in other words, unless about 650 votes are cast this letter ballot will not be canvassed. At this same stage in the proceedings, the effort to get a committee on rail joints failed. One-third of the corporate membership of the Society did not care enough about the matter to vote at all. Such indifference to an important and interesting item in the civil engineering of railroading seems extraordinary in a society of whose total membership some 20 to 25 per cent. get their living directly in railroad service, besides the great number whose living comes indirectly from the railroads. Now comes another occasion to test this interest.

The Board of Direction, as required by the constitution, presented to the Society a brief of the arguments for and against the appointment of this committee. One very serious argument was not mentioned at all, perhaps because the Board thought that this argument is undignified, or that the mention of it would be inexpedient. That argument is the effect of this action on the influence and prestige of the Society, and concerning this we shall say something later.

It is true that no change in the sections ought to be made, except after most careful consideration, and no change should be made unless the reasons for it are powerful. Most of us think that these sections are rational, and indeed much the most rational that have ever been drawn. They have been widely adopted, and their use is spreading fast. Probably 70 per cent. of all the rails rolled in the United States in 1900 are rolled to the Society sections. They have simplified and standardized practice, to the advantage of railroads and rolling mills and to the comfort and relief of railroad engineers. All of this is true and all of this makes a change undesirable on the face of the matter.

But since these sections were contrived several important things have happened and some things have been learned. Conditions have been changed. The rolling mills have actually taken means to finish rails at a lower temperature. This is probably one of the most important improvements in mill practice that has been begun in many years, but it seems to have been found out that the flange of the American Society section is relatively too thin for the best results, perhaps even for successful results, in this cooler rolling. Further, the process of re-rolling worn rails seems likely to become an important element of economy, and it is found that a thicker flange will better fit the rail for re-rolling. Here we see the great technical reasons for a careful study of the subject by a committee having authority. These reasons do not seem hard to grasp and they do seem important.

Among the objections to the appointment of a committee the Board mentioned the fact that no evidence had been presented to that body that the railroads or the mills have found the American Society sections unsatisfactory. Individual members of the Board must have been aware of the spring of this movement for an examination into the subject, even if nothing had been brought before the Board officially. The matter has been spoken of many times by those who speak with authority. For example, at the annual meeting of the American Railway Engineering and Maintenance of Way Association last March a committee of ten presented a report on rails. This committee included several members of the American Society committee which made the present standard sections, and it included several gentlemen who are among the highest living authorities on rails. In its report the committee said, "Some things have developed with the American Society sections on account of this change of finishing temperature which indicate that the flange will probably have to be increased. . . . If all rails hereafter are to be rolled at a lower temperature we think the section should be modified, and that the sooner the change is made the better for all concerned." In the discussion of this report the Chairman of the committee said, "in December the Carnegie Steel Company commenced to roll the rail at a lower temperature, and that is where we commenced to get definite information as to the difficulty. The flanges of the rail become black and we have difficulty in getting a perfect pattern. We will take this matter up with the rail makers and see what can be accomplished. The American Society section is coming into greater use each year, and if we make a recommendation now to change the section, the sooner it is done the better. We expect to make a definite recommendation at the next meeting." In the same discussion Mr. W. R. Webster, a member of the committee, said, "the ordinary method of rolling with the proper amount of work on the rails at a low enough temperature will produce just as good rails as by re-rolling, but on account of the flanges losing the heat so much sooner than the head it is difficult to do this, particularly with the heavy sections. . . . The Carnegie Steel Company has, at considerable expense, changed the position of the finishing rolls at the Edgar Thomson mills in order to hold the rails back before the last pass. . . . In any of these methods of rolling, the thin flange is the troublesome feature. This can be overcome to a large extent by putting more metal in the flanges of the heavier sections in order to carry the heat longer and allow the work of rolling on the head at a low enough temperature to produce the tough, good-wearing steel of the old lighter rails." Precisely the same thing has been said repeatedly by other high authorities within the last eight or ten months, as may be seen in the pages of the *Railroad Gazette*.

There are two good reasons why definite information should not have reached the Board that there is reason to suppose that railroads and mills would like to have the American Society sections modified. (1) The Board has no machinery for receiving such information; it could only reach that body as other knowledge does, through the ordinary channels by which knowledge is conveyed from man to man. It is precisely, in order that this kind of information may reach the Board, that the movement to create this committee was started. (2) The one modification that seems to be needed is the result of very recent conditions. Naturally, the railroad officers and the mill officers are guarded in speaking of a matter so important and so complicated. They are especially so for the very reason that it would be inexpedient to shake confidence in the American Society sections. This is precisely one of the best reasons for appointing a committee. Such a com-

mittee, made up of discreet and well-informed men, going with the weight of the American Society behind it, would get information and opinion which cannot properly be made public.

We have spoken of this movement as affecting the influence and the prestige of the Society. To every loyal member that is a matter to think seriously about. The American Society of Civil Engineers has now the credit of having established the best rail sections (for flanged rails) that have ever been drawn. If those sections are to be changed the Society should initiate the change and prescribe it. Probably those sections will have to be changed, at least in the heavier weights, and the chances are that within eight months a strong and enterprising young society will bring in a report recommending a change. This young society contains many members of the American Society of Civil Engineers and its opinions and actions are largely influenced by those members. There is every disposition to treat the American Society with the consideration and respect due to its seniority and to its high position. Of the ten members of the rail committee of this younger society six are members of the American Society of Civil Engineers, and of course they would much prefer that the modification should originate with the American Society and should go before the public with its sanction.

It would be surprising to discover that there are not 650 men in the American Society so interested in this serious technical question and so interested in maintaining the prestige of the Society as to take the trouble to vote on the letter ballot. It would be a good deal better to vote against it than not to vote at all. It would be more respectful to the gentlemen who have started the movement and to the Board which has furthered it to this point.

Air-Brake Repairs.

By far the biggest thing just now in brake matters is the maintenance of freight car brakes, and we are glad to be able to print an interesting article by Mr. Otto Best describing in detail the methods of handling the inspection and repairs of air-brakes on the Nashville, Chattanooga & St. Louis. No doubt these methods are the most systematic and complete of any in the country. We recently spent a couple of days at Nashville going through the yards and watching the air-brake inspectors and repairmen at work. Everything is systematic and business-like and just as Mr. Best describes it.

All appear to know what they are expected to do and how to do it, and the work is done thoroughly. The inspectors are well organized, well supplied with tools and materials and no time is lost running around for things. A repaired triple is known to be in first rate condition before it is put on a car. Records are kept of all work done and a bad job is traced directly to the man who did the work, and the whole air-brake department is so keyed up that bad work is sure to be detected. These are a few of the things one notices at Nashville which contribute directly to the fine results obtained by the air-brake department of the Nashville, Chattanooga & St. Louis.

But behind all this is the fact that the management of the road has taken an active interest in this work, and the importance of this factor should not be lost sight of. We judge it is the key to the whole situation. Probably it is not too much to say that there can be no marked improvement in the general condition of freight car brakes until the air-brake department has the support of the managing officers; given this support the organization and facilities for maintaining air-brakes are sure to follow. Probably now the most encouraging sign is the interest managing officers are taking in this question of air-brake repairs, as a result of the discussion started at Saratoga.

By keeping up the brakes the train service is improved, a larger return is got for the money invested in air-brakes, and a nice saving is made in the item of car repairs. It is probably a conservative estimate that on 50 per cent. of the freight cars, the triple valves and brake cylinders have not been cleaned within a year. That is, through neglect alone, one-half of the air-brakes to-day are not doing what they are designed to do and are subject to a variety of disorders. Of the other half, stenciled as cleaned within a year, some large part is likewise inefficient, if not inoperative, on account of improper cleaning and the failure to make needed repairs. Something like $60,000,000 has been spent in applying brakes to freight cars and no return is given for this investment if the brakes are inoperative, and less than a full return if they are left in bad order. The loss is not inconsiderable from bad order brakes. It is useless to attempt to estimate the loss through delays and accidents to trains on account of defective brakes, but to avoid these things is the strongest argument for maintaining the brakes.

In the item of car repairs, there are possibilities for savings which show up well in comparisons, and these savings, at Nashville, more than offset all the expense for keeping up the brakes. For instance, at that point, before the present system was installed, there were as many as 100 freight cars a month with wheels so badly skidded as to require renewals. By giving proper attention to the brakes, this has been reduced to about six freight cars a month with slid flat wheels, representing a direct monthly saving of about $3,600. Further, slid wheels in passenger service have been reduced from about 50 pairs a month to practically none. In the item of wheels alone, at Nashville, the saving has been much more than the cost of the air-brake inspection, repairs and testing, for which 16 inspectors and helpers are needed. Plainly the enginemen were not to blame for these slid wheels.

Before leaving this topic, a word may be said as to the chief cause for wheels sliding. It seems to be generally believed that wheels are oftenest skidded near the end of a stop, either because of a bad condition of rails or an excessive pressure on the brake shoes. While these conditions are conducive to skidded wheel and doubtless are accountable for some skidding, yet it appears that the failure of the brakes to release causes the greatest part of the trouble. That is the majority of wheels are skidded in starting trains and not in stopping them. The most common defect now found in triple valves is leaky piston packing rings, and the result of this defect is that the brakes fail to release. With the powerful locomotives now used it is possible to start a freight train with the brakes set on one or two cars (due to defective triple valves), and the chances are, if the train is hard to start, the engineman uses sand and so hastens the process. The locked wheels in sliding but a short distance on sanded rails get flat spots sufficient to condemn them. The experience at Nashville has been that wheel skidding can practically be eliminated if the air-brakes are kept in good order; when slid flat wheels are found the triple valve bush is generally worn.

The essentials of the air-brake work at Nashville appear to be: Intelligent inspection; triple valves cleaned and repaired in a shop where all the work is concentrated; repaired and cleaned triples are carefully tested and known to be in good order before they are applied to cars; records are kept of all work done; only such minor triple repairs are attempted as can easily be made without deviating from the standards, and all triples requiring repairs which can only be made properly through the use of special machinery are sent to the makers.

If this air-brake work is to be done well and at the same time economically, the triple valves must be removed from cars and the work concentrated in suitable repair shops. It is an advantage all around. It takes about five minutes for an inspector to remove a defective triple and replace it with one known to be clean and in good order. That is by replacing triples, the defect can be remedied with certainty in about five minutes. There is no certainty that an inspector can find the defect in five minutes, let alone repairing the triple on the ground. The scheme of replacing all defective triples reduces the time required to inspect the brakes on through trains, and above all saves cutting out cars when there is not time to make repairs. It is without doubt the best way to handle this work.

Concentrating the cleaning and minor repairing in a shop especially fitted up enables a few skilled men to do all of it. Good work is insured at a small cost, as the men work without interruption and with suitable tools at hand. It also makes possible the testing of all triples before they are again put into service.

It will be noted from Mr. Best's description of his triple valve test that the conditions are those of a valve at the rear of a very long freight train; in other words, the extreme conditions. The air admitted to release the repaired triple passes through a 1-32-in. hole. Between the hole and the test triple are 15 ft. of 1 in. pipe, so that the train pipe pressure is increased very slowly. To pass the three tests (light service, full service and full emergency), it is absolutely necessary that the triple piston fit the bushing throughout its length as closely as in a new valve. In fact, in several cases it has been found that new valves, direct from the makers, will not pass this test, which gives a good idea of its severity. In no case has a triple passed this test and failed to perform properly in service. On the other hand, the test has shown repeated cases of worn triple bushings, which would not have been detected in the ordinary course of cleaning, but would have failed to release in service. This test further shows the folly of railroads trying to do what may be called "heavy triple valve repairs." No work of this kind is done at Nashville.

For instance, no one familiar with the methods of the Westinghouse Company in fitting triple valve pistons would attempt to re-bore a worn bushing and substitute larger packing rings than the standard. Yet such rough work as this is being done by some roads, and is causing no small part of the trouble with air-brakes. It can only be ascribed to pure ignorance. We have prevailed on Mr. Best to write an article on how **not** to clean and repair triple valves and brake cylinders, and cases like this will doubtless be included in that article. It is sufficient to say that any "heavy repairs" to triple valves should be made by the makers. The Westinghouse Company is now equipped to do this class of repair work quickly and at a much smaller cost than railroads can do it. When it comes to doing such work as this and restandardizing worn triples, it is conceded that it cannot be done outside the Westinghouse works. It is the finest kind of machine work, and requires special tools, skilled men, and the most accurate gages and measuring instruments.

The Nashville, Chattanooga & St. Louis has been over two years working up its present system for maintaining air-brakes. While the details of the system may be varied from time to time, it is thought that the essentials are correct and that they are generally applicable to all roads.

One of the recent Russian railroad enterprises was the extension of a narrow gage railroad from Moscow northward through Jaroslav to Archangel, mostly through a very thinly peopled country with nearly arctic climate, but possessing resources in timber and fisheries which were cut off from the peopled part of Russia more than half of the year by the freezing of the rivers. Of this, 174 miles, to Jaroslav, is comparatively old. The extension to Archangel, 521 miles, was undertaken by a company at the head of which was a great Moscow capitalist, Mamontoff, who failed disastrously before the extension was in working order, so that the government felt compelled to take it over, and it has apparently made it possible, as the time-table shows one train a day over the extension, which gets over the 521 miles in 36¾ hours. It is now reported that the government has transferred this railroad to a company of Belgian capitalists, together with a contract requiring them to build a new railroad at right angles with this, extending from St. Petersburg but little south of east, to Wjätka, where it will connect with the railroad line which connects the Siberian Railroad with Archangel, and thus open an outlet from the latter railroad directly to St. Petersburg, passing perhaps 300 miles north of Moscow. The distance from St. Petersburg to Wjätka is about 700 miles in an air line; but by utilizing lines already constructed, perhaps 400 miles of new railroad will complete a connection. It would seem idle, however, to expect any considerable development of traffic in the country on the line for a long time to come; and in fact one of the reasons urged for building the road is to give employment to the suffering manufacturing industries, as in the case of the Moscow-Kasan line. But there will never be any end to this process. The experience of this country shows plainly enough that nothing but disaster results from building railroads before their time—that is, before the country is able to settle and develop the resources of the country made accessible by the new lines.

The scalpers seem to be catching it everywhere. Among the other cities where the railroads have taken vigorous action against them is San Francisco. Application for an injunction was made there on the occasion of the Epworth League Convention. As in cases of this kind elsewhere, the defendants appear to have succeeded in prolonging the proceedings until after the convention was over, but a decision was finally rendered by Judge Murasky in the Superior Court in favor of the railroads; and this decision is worthy of note by reason of the emphasis laid on a point, which, while it seems to be obvious in nearly every case, appears to be usually ignored by the courts. In this case the Judge said that "in order to use the tickets the persons to whom the scalpers sold them would have to personate the original purchasers, whose descriptions and signatures were on the tickets, and would have to forge the signatures of these persons. A person seeking relief in an action in equity, which this suit was, should come into court with clean hands, while the admissions of the scalpers showed that the use of the tickets by persons other than the original passengers would be wrongful." He said that the only adequate means which the Southern Pacific had to keep other persons from traveling on the tickets was by an injunction, as it would not be practicable to bring a suit for every violation of the agreement on the Epworth League tickets. The words in quotation marks embrace the point to which we would call attention. How is it that this vital question is so often overlooked or buried out of sight under wordy arguments about secondary issues?

NEW PUBLICATIONS.

The Journal of the Iron and Steel Institute. Vol. LIX. Edited by Bennett H. Brough, Secretary. Octavo, 620 pages; illustrations, plates and index. London: E. & F. N. Spon, Ltd.; New York: Spon & Chamberlain, 1901.

This volume contains the minutes of proceedings of the annual general meeting held last May, with the addresses, papers, discussions, etc. It contains also the usual valuable "notes on the progress of the home and foreign iron and steel industries," together with mineral statistics of all countries.

How to Become a Good Mechanic. By John Phin. Second edition, octavo, pamphlet, 68 pages. New York: Industrial Publication Company. 25 cents.

The first edition of Mr. Phin's pamphlet was published in 1883. He says that the demand for it has continued, although it has been for some time out of print; consequently he has decided to rewrite it and attempt to bring it up to date, so far as revision was necessary. The pamphlet is intended as a practical guide to self-taught men, and it is a useful little volume. It treats of education (using the word in its ordinary limited sense), and 50 various branches and methods of study for self-taught students.

TRADE CATALOGUES.

Falls Hollow Staybolts.—The Falls Hollow Staybolt Company, of Cuyahoga Falls, Ohio, issues a card giving outside and inside diameters of hollow staybolt, iron and steel. This card will be sent to those who ask for it.

Stone Breaking Machinery.—The F. C. Austin Mfg. Co., of Harvey, Ill. (offices in New York, Chicago, San Francisco, etc.), sends an illustrated pamphlet describing the Austin Gyratory crusher, also describing complete stone breaking plants and cars and apparatus for handling broken stone. The Austin crusher is built in sizes having a capacity of from two tons an hour up to 200 tons an hour and running in price from $400 to $7,000. The crusher is shown by photographs of parts and in line drawings. Dimension drawings are also given of breaking and screening plants.

The Royal Wood Preserver.—The Royal Wood Preserver Company, of St. Louis, Mo., sends a pamphlet advertising the properties and uses of the preservative material made by that company. It is a dressing applied with a brush or by immersing the wood. One gallon will cover 300 sq. ft. of dressed oak lumber, or 150 sq. ft. of rough yellow pine. It is a thin liquid, of high specific gravity and is said to penetrate well. Letters are given from the Chicago & Western Indiana Railroad, the St. Louis Car Company, the Quincy Dredging & Towing Company and a dozen other companies, all testifying to the value of this preservative material.

Industrial Particulars on the Lackawanna Railroad.—Issued by Wm. B. Hunter, Esq., Industrial Agent, 26 Exchange Place, New York City. Mr. Hunter has brought out an industrial guide to the lines of the Lackawanna, giving alphabetically the names of towns and under each town a brief description of its population, leading industries and shipments, ordinary wages and rents and certain other information. It is designed first to help manufacturers in the selection of sites for shops, and second to help cities and towns to grow through the introduction of new industries.

Paint.—The Sherwin-Williams Company, of Cleveland, Ohio, and eight other cities, has issued an octavo volume of 76 pages, handsomely printed and bound in muslin, designed to describe the product of that company and its special applications. The colors for passenger cars, trucks and platforms, freight cars, cabooses, refrigerator cars and locomotives are described in considerable detail and shown by samples. Colors for the maintenance of way department and for general purposes are shown and described in the same way. Besides this special information the volume contains considerable general information about pigments and varnishes.

Highway Bridge Specifications.—The American Bridge Company issues a pamphlet, prepared by the engineering department under Mr. C. C. Schneider, Vice-President, being General Specifications for Steel Highway Bridges. The pamphlet is 30 pages, and besides the specifications has tables of uniform live loads, moments, end shears and floor beam reactions; dimensions of rolled beams for beam bridges, permissible compressive strains, maximum bending moments on pins and shearing and bearing value of rivets. The company divides highway bridges into six classes, ranging from city traffic to ordinary highway traffic on country roads, and including two classes of electric street railroad bridges. It recommends rolled beams up to 25 ft., beams or plate girders up to 40 ft., plate or lattice girders up to 80 ft., lattice girders up to 140 ft., and above that lattice girders or pin connected trusses. The special attention paid to electric railroad bridges is particularly important and is a matter that has been much neglected heretofore.

Gas Plants.—The Loomis-Pettibone Company, No. 52 Broadway, New York, issues a circular designed to set forth the uses of gas for power and for forging, tempering and annealing, welding, melting, etc. Naturally the purpose is to enlarge the demand for gas plants, that being the special product of this company. Examples are shown of installations of gas plants in various great works as, for instance, at the Middletown Works of the National Tube Company, where gas is used for welding tubes and couplings, also at the works of the Winchester Repeating Arms Company. This company has been engaged for many years in building gas plants for fuel purposes and has developed methods for producing gas for power at the lowest cost and adapting apparatus for the use of all kinds of fuel. The following sentences from the introduction to the pamphlet would gratify Mr. George Westinghouse:

"A gas that can be made from any and all grades of fuel, in an apparatus that can be as readily installed and operated as a steam boiler plant, is, through the gas engine, to revolutionize the motive power of the world. The gas engine of to-day rivals the steam engine in smoothness of working and regulation of speed. Gas engines can be had in units up to 1,000 h.p. that are efficient, steady, reliable and will run 10 hours per day or 24 hours per day with a fuel consumption of not to exceed one pound of coal per brake horse-power per hour."

Centenary of the First English Railroad Act.

Although England is undoubtedly the mother-land of railroads, its press entirely ignored so interesting an event as the centenary of the passing of the first railroad Act. This received the Royal Assent, by commission, on May 21, 1801, and was for the construction of a line from Wandsworth southward to Croydon, called the Surrey Iron Railway. The line started from the east side of a small creek or inlet on the south side of the Thames, adjoining the mouth of the river Wandle.* A dock and wharf with an inner basin, which is still in use, was formed here, the railroad running out at the south end into Red Lion street. It crossed the High street, passed twice over the Wandle on wooden bridges and came into Garratt Lane opposite the Waggon and Horses Inn. From there it continued along the lane as far as Summerstown. The lane having been widened, now includes the site of the line most part of the way. From the Plough Inn at Summerstown the course is now that of Mead Path till the London and Epsom high-road is reached just above Merton. The old railroad crossed this on the level and went straight on to Mitcham in the line of the present right-hand road. From the bend it went by Baron Walk and turns up on the south side of Mitcham station as a lane called Tramway Path. This soon becomes occupied for about a mile, by the existing railroad from Wimbledon to Croydon. From near Beddington Lane station the route of the Surrey Iron Railroad led across Mitcham common and the fields and cannot now be traced, but from Waddon Marsh Lane near the present railroad it ran past the site of the Croydon Corporation's Electricity works and ended about where the Gun Tavern now stands, a little north of Croydon Parish Church. These particulars will enable anyone to follow most of the route of the old tram road, but no trace of its works remains. The country is nearly flat, so that none of importance were required. The rails were cast-iron plates, 36 or 38 ins. long, resembling the letter L in section, resting upon stone blocks, 8 or 9 ins. thick and 15 or 16 ins. square. The two rows of L's being back to back, ⊥⊥, it is plain that common carts could use the railroad, whilst railroad tracks could use the highway. The tread of the plates was 4 ins. wide, the flange being hog-backed, about ½ inch thick. A rib was cast underneath also, for additional strength, the weight of the plates being 40 lbs. each. They were secured to the blocks by a square-headed spike at each end, fitting a notch with sloping sides in the ends of two rails. The head of the spike was, thereafter, countersunk, so as not to obstruct the wheels. Wooden plugs or trenails in the blocks were required to give a good hold to the spikes. The railroad was a double line, with cross-overs here and there and probably a few sidings for local traffic. No passengers were conveyed; it is even doubtful if the company possessed any rolling stock. The trucks used on the early tram-roads belonged generally to carriers who let them for hire, or to traders along the line. Anyone, however, could use the railroad on paying the tolls, if his vehicles were not likely to injure it. Most of the trucks, which were very small, weighed about one ton and carried three, on cast-iron wheels some 30 inches in diameter, running loose on the axles.

As to the motive power of the establishment, it was not of an imposing order. Miserable teams of half-starved and worn-out horses, donkeys and mules constituted the locomotive department. What little traffic there ever was, and the line was a deplorable failure from first to last, consisted of coals and manure brought to Wandsworth by river, and in the other direction lime, fuller's earth and stone carried down from Merstham to Croydon by a similar railroad belonging to a different company. This other line, which was sanctioned in 1803 and opened two years later, has left considerable remains alongside the Brighton road at various points south of Croydon. It rejoiced in the long-winded title of the Croydon, Merstham and Godstone Iron Railway. Not that it ever went to Godstone, though it intended to: but the most interesting fact about these curious old tram-roads is that they were really portions of an abortive scheme for connecting London and Portsmouth. Such lines were often made in lieu of canals where water supply was deficient. Many canal Acts conferred power to make short bits of railroad, but these were altogether subsidiary to the waterway and regarded as inferior to it. In this case, though efforts had been made to get a good line of inland navigation to Portsmouth, and the Croydon Canal was made as the first part of one, the Surrey Iron Railway Act was for a railroad alone and was not connected with any canal scheme. It was thus undoubtedly the first railroad Act pure and simple.

The line was formally opened on July 26, 1803, when the Committee, or Board of Directors as they would now style themselves, proceeded to Croydon in wagons drawn each by a horse. Doubtless the wagons were quite indispensable for bringing home the worthy committeemen, as they dined at the King's Arms and spent the day "with the utmost conviviality." Most of the Committee were local manufacturers, for in those days the river Wandle provided power for a great number of calico-printing works, oil mills and snuff mills. These latter were very flourishing, as everyone, from George III. and Queen Charlotte downwards, took snuff by the handful. A sprinkling of bankers and city men completed the directorate, but as only links in a long line never carried out, both the Surrey and Merstham companies were foredoomed to failure.

The distance by the Surrey line from Wandsworth to Croydon was about 8 miles, but there was a branch from Mitcham Common to some mills and works on the Wandle at Hackbridge. The course of this branch lay along a continuation of Tramway Path, coming out at the Goat Inn at Beddington Corner. One or two sidings into other works existed, the whole length of the system being as nearly as possible 10 miles. It was laid out by William Jessop, who undoubtedly succeeded Brindley as the foremost canal engineer of those days. The firm of Outram & Jessop were also iron founders on a large scale at Butterley, in Derbyshire, where the works they established are still flourishing. Benjamin Outram's father invented rails or tram-plates of the kind just described and first laid them on a colliery line at Sheffield, owned by the Duke of Norfolk, in 1776. The rails of the Surrey Iron Railway came from Butterley, and the stone blocks, about 61,000 in number, from quarries at Cromford, near there, belonging to Outram.

The Merstham line being purchased by the London & Brighton Railway Company, was closed by them in 1838, whereby the ruin of the Surrey Iron Railway was completed. After lingering on in a practically abandoned state, it was closed for traffic on Aug. 31, 1846, the materials taken up and sold, the wharf and premises at Wandsworth finally coming under the hammer on June 8, 1848. Two months later, on Aug. 3, the company itself ceased to exist. Such was the melancholy fate of the first public railroad.

W. B. Paley.

Chelsea, London, S. W., August, 1901.

*West of the Waterloo terminus in London of the London & Southwestern, Wandsworth being the next station beyond Clapham Junction.

TECHNICAL.

Manufacturing and Business.

The Philadelphia Machine Tool Co., Philadelphia, Pa., has been made sole agent for the testing apparatus invented by Gus C. Henning. These include: the Henning pocket recorder; double electric micrometer; mirror extensometer; roller extensometer, and bridge extensometer. The last named is fitted with autographic device when desired.

The Standard Railroad Signal Company, of Troy, New York, which was organized under the laws of the State of New Jersey, has been succeeded by the Standard Signal Company, organized under the laws of the State of New York. This change was thought advisable, as the company has for some time been doing business in the State of New York. The capital of the company is $300,000. The directors are: Alfred H. Renshaw, Palmer C. Ricketts, Henry Burden, Jr., John T. Cade and Harvey N. Loomis. The new company is about to again move its plant to a site in the vicinity of Troy in order to secure enlarged facilities, the business of the company having outgrown the plant bought in 1898. Eighteen acres of land on the line of two railroads has been secured, where new buildings will be put up during the next 18 months.

Iron and Steel.

The stockholders of the Bethlehem Iron Co. voted, on Aug. 15, to accept the $7,500,000 offered by the Bethlehem Steel Co. for the steel and ordnance works at South Bethlehem, Pa.

The Iowa Iron & Steel Co., St. Louis, Mo., has been incorporated with a capital of $1,000,000, to absorb the Waukan Iron Co., of Waukan, Iowa. It is understood that the plant will be transferred to a large idle blast furnace plant on the Mississippi at St. Louis, and that one or more charcoal-iron furnaces will be built.

The pig iron statistics, published by *Iron Age*, for Aug. 1, show that the make of coke and anthracite iron declined from 303,793 tons weekly, on July 1, to 297,269 tons weekly on Aug. 1. The stocks of pig iron reported by makers remained practically stationary, thus showing that consumption is taking care of the current output, large as it is.

At a meeting of the directors of the Cambria Steel Company, in Philadelphia, on Aug. 15, the capital was increased to $50,000,000 from $4,320,000, and three new directors were elected, namely: Leonard C. Hanna, of Cleveland; Frank J. Firth and Theodore N. Ely, of Philadelphia. The directors were chosen in the interest of the Pennsylvania Railroad, which controls the Cambria Steel Company. The proposition to merge with the Conemaugh Company was ratified.

Lifting Jack Patents.

On July 2 last, the United States Court of Appeals at Cincinnati, O., affirmed the decree of the Circuit Court upholding the validity of Patents Nos. 455,993, 455,994 and 455,995 granted to Josiah Barrett for improvements in lifting jacks. The Barrett jacks are made by the Duff Manufacturing Co., Allegheny, Pa., and that company brought suit against the Kalamazoo Railroad Velocipede Car Co., with the results as given above.

Ventilating Fans for Cars.

The Safety Car Heating & Lighting Company is bringing out a fan to be driven by compressed air to be used instead of the common small electric fan. A number of these are being applied to a train on the New York Central. The air is to be supplied by putting an extra pump on the locomotive. It will be carried back through the train by the steam-heating pipes, which, of course, are out of service when these fans are most required. The same arrangement is under trial on the Erie as well as on the New York Central.

Pennsylvania Iron and Steel Output in 1900.

According to statistics issued by the Pennsylvania Bureau of Statistics, the production of steel in the State of Pennsylvania during 1900 fell off 189,384 tons as compared with the record breaking production of the previous year. Despite this decrease Pennsylvania contributed nearly 47 per cent. of the steel produced in the United States and the total production of this one State was greater than the steel production of Great Britain during the same period. The production of steel amounted to 6,256,775 tons and of pig iron 6,365,935 tons.

German Locomotives for Egypt.

Messrs. Henschel & Son, of Cassel, Germany, will deliver to the Egyptian State Railways 15 passenger engines (simple engines) with 6-wheel tenders complete, a number of which must be delivered in the beginning of next year. The engines have four drivers and a four-wheeled bogie in the front; the cylinders are inside the frames. As special equipment the engines are provided with Hardy's vacuum brake and a cow-catcher. The following are the principal dimensions:

Engine:	
Diameter of cylinders	18 in.
Piston stroke	24 in.
Diameter of drivers	75 in.
Steam pressure	160 lbs.
Heating surface, fire-box, inside	23.78 sq. ft.
Heating surface, tubes, inside	960.152 sq. ft.
Heating surface, total, inside	1,083.93 sq. ft.
Grate area	21 sq. ft.
Weight in working order	About 99,000 lbs.
Tender:	
Capacity, water	3,000 gals.
Capacity, coal	4½ tons
Diameter of wheels	44 in.
Weight in working order	About 74,800 lbs.

Signaling Notes.

Acetylene gas is being tried in a number of dwarf signal lights on the Pennsylvania road at Altoona.

The Louisville & Nashville Terminal Company has just completed at South Nashville, Tenn., an interlocking plant controlling 40 switches. According to the *Nashville Banner* this plant is worked by one of J. W. Thomas, Jr.'s, pneumatic interlocking machines. The Louisville & Nashville Terminal Company is controlled jointly by the Louisville & Nashville and the Nashville, Chattanooga & St. Louis, and its lines include the Union passenger station and its approaches. The completion of the improvements at South Nashville enables the two roads to use the lines between that point and the Union station as a double track railroad.

The Pennsylvania Railroad now has in service a number of the electro pneumatic block signals which have been in course of construction for several months between Philadelphia and Paoli. This is a four-track line, but some of the signals are so situated that a bridge could not be used for their support, and bracket posts are used. These are metal posts of an original design. The electric circuits used with these signals are all worked by means of storage batteries, and these batteries are charged by a dynamo located in the middle of the twenty mile section.

Officers of the Allis-Chalmers Company.

Following are the directors and officers of the Allis-Chalmers Co. now owning and operating the Edward P. Allis Co., Fraser & Chalmers, Gates Iron Works, and the Dickson Mfg. Co. (exclusive of the locomotive works):

Directors: William W. Allis, chairman, Milwaukee; W. J. Chalmers, Chicago; Elbert H. Gary, New York; William A. Read, New York; Cornelius Vanderbilt, New York, for three years; Charles Allis, Milwaukee; James H. Eckels, Chicago; William L. Elkins, Jr., Philadelphia; Max Pam, Chicago; James Stillman, New York, for two years; Edward D. Adams, New York; Frank G. Bigelow, Milwaukee; Mark T. Cox, Orange, N. J.; Henry W. Hoyt, Chicago; Edwin Reynolds, Milwaukee, for one year.

Executive Committee: W. J. Chalmers, chairman; Edward D. Adams, Charles Allis, James H. Eckels, Henry W. Hoyt, Max Pam and Cornelius Vanderbilt.

Finance Committee: William A. Read, chairman; Edward D. Adams, W. J. Chalmers, Mark T. Cox, Elbert H. Gary.

Officers: President, Charles Allis, Vice-President, W. J. Chalmers; Second Vice-President, Henry W. Hoyt; Third Vice President, Joseph H. Seaman; Treasurer, W. J. Chalmers; Secretary, John W. Young, New York; Assistant Secretary, Joseph O. Watkins, Chicago; Chief Engineer, Edwin Reynolds; Controller, Benj. T. Leuzarder, Chicago; General Counsel, Max Pam; Assistant Treasurer and Transfer Agent, George A. Brewster, New York. The main office is in the Home Insurance Building, at Adams and La Salle streets, Chicago. The Eastern office is in the Broad Exchange Building, 25 Broad street, New York.

The Air-Brake Record of the N., C. & St. L.

Below are reports of air-brake cars received at and forwarded from Nashville yard, June, 1901.

Air-brake cars cut out leaving Nashville:

Number of air-brake cars forwarded	8,776
Air-brake cars O. K.	8,716
Air-brake cars cut out	60
Average serviceable air-brake cars per train	18.3

Of the 60 cars cut out, there were:

Blowing at exhaust:	
Westinghouse	7
New York	5
Landsberger	5
	17

Of the 60 cars cut out 40 belonged to railroad companies, 20 to private car lines.

Of the air-brake cars forwarded 7,777 were equipped with apparatus of the Westinghouse Air Brake Co., 993 with apparatus of the New York Air Brake, 6 with apparatus of the Landsberger Air Brake. Of the Westinghouse cars less than one-tenth of 1 per cent. were cut out for blowing at exhaust, about one-half of 1 per cent. of New York cars and 83 per cent. of the Landsberger.

Air-brake cars cut out coming into Nashville:

There were 417 air-brake cars received at Nashville with brakes cut out for the following reasons:

Triple valves needed cleaning	78
Blowing at exhaust	83
Blowing at vent port	19
Triple piston packing rings worn out and broken	21
Check valve case gasket blown out	22
Works emergency, service application	17
Release valve leaking	22
Train pipe union leaking	14
Branch pipe union leaking	47
Branch pipe broken	18
Brake rigging out of order	30
Flat wheels	21
Miscellaneous	24

THE SCRAP HEAP.

Notes.

The Duluth, South Shore & Atlantic will build a greenhouse at Marquette to supply flowers to its dining cars and for the half-dozen small parks at stations.

Of the ticket brokers recently arrested at Buffalo charged with dealing in tickets on which the signature of Joint Agent H. T. Smith had been forged, seven were held for appearance before the Grand Jury.

In a ticket broker's office at St. Louis, which was searched recently by detectives, 39 tickets were found purporting to have been issued by a number of roads, the names of which are bogus, there being no such roads in existence. Five different names are represented.

The *Colorado Springs Gazette* prints a story, which apparently has some basis of fact, that General William J. Palmer has presented to the old employees of the Rio Grande Western 10,000 shares of stock of the road. The preferred stock is worth considerably more than par, and the common about 85. One or two of the officers of the road are said to have received as much as 1,000 shares each. All classes are remembered, including some clerks and section masters. General Palmer has been at the head of the company from its birth. The property has lately passed under the control of the Denver & Rio Grande.

The Delaware, Lackawanna & Western, on which road there was recently a disastrous explosion as the result of a collision of freight trains, in one of which was a car which contained dynamite, has issued revised regulations for the transportation of explosives. These regulations prescribe the methods for the packing, marking and handling of "common black powder," and it appears that all explosives more powerful than those included under this head are to be refused unconditionally. Black powder must be carried only in specially selected cars, equipped with air-brakes. Shipments must not be received on Saturday or Sunday.

Traffic Notes.

The Norfolk (Va.) Freight Bureau has complained to the State Railroad Commissioner against the railroads terminating in that city for discriminating against the Belt Line stock yards in favor of the Union stock yards.

Newspapers in Washington and Oregon say that the railroads in those states have suddenly ceased giving passes to freight shippers; a result, it is supposed, of the union of the interests of the Southern Pacific and Union Pacific roads.

The Louisville & Nashville has reduced the rates on coal from the mines in Alabama to the principal points on its lines in that State, the reductions varying from 5 per cent. to 60 per cent. It is understood that these reductions are the result of the competition of fuel oil from Texas.

Both the Southern Pacific and the Santa Fe announce that from Sept. 1, season ticket rates between Los Angeles and the surrounding towns will be reduced to the basis of about half a cent a mile. The newspapers state that this reduction is made for the purpose of heading off proposed new electric railroads.

The Corporation Commission of North Carolina has ordered that on and after Oct. 1 the Seaboard Air Line and the Southern Railway shall use on all their lines the standard freight and passenger rates established by the Commission. Heretofore the use of higher rates has been allowed on certain branch lines. The Atlantic Coast Line has voluntarily made a reduction of this kind.

The Railroad Commission of Alabama, on complaint of the Shippers' & Buyers' Mutual Aid Association of Birmingham, has issued an order to the effect that the Alabama Car Service Association, which charges demurrage on freight cars not promptly unloaded, must pay the consignee a dollar a day on every car which is not placed ready for delivery of the contents within 48 hours after it arrives. The order contains a proviso that delays due to the weather, or to circumstances not chargeable to negligence of the railroad, shall not be paid for.

South Dakota Rate Suit.

The long pending suit in the United States Court concerning freight and passenger rates in South Dakota has been decided in favor of the railroads. Judge Carland, in a decision filed at Sioux Falls, Aug. 9, holds that the tariffs prescribed by the State Railroad Commissioners are unconstitutional, as taking the property of the railroads without just compensation; the rates would not afford reasonable compensation for the service performed. The decision states that when circumstances have changed, so that the rates shall be reasonable, the Commissioners may apply for a further order.

The case has been in the courts since 1897. It was once decided in favor of the Commissioners, but on appeal to the United States Supreme Court was remanded to the lower court, with instructions to appoint a master in chancery to ascertain the railroad companies' earnings in order to arrive at the equities in the case. This investigation has been going on for some time, and a report of the special master was filed last June. It is upon this report that the present decision is based.

A Railroad Clearing House in India.

G. B. Goyder, Chief Auditor of the Jodhpur-Bikaner Railway in India, writes to Mr. William Nicholson, Manager of the Central Railway Clearing House, Buffalo, under date of June 30:

"I have been much interested in an article I have read in the *Railroad Gazette* of May 24 on the Central Railway Clearing House at Buffalo. I have recently organized here a new audit office for the Jodhpur-Bikaner system, and am naturally much interested in the clearing house system described in the *Gazette*. I am very anxious to secure further details of this organization, and shall esteem it a great favor if you will kindly help me by correspondence and by sending me samples of the blanks you use."—*Buffalo Commercial.*

To the reader of Kipling the name of this railroad brings up a hundred associations. It is a Native State line in Rajputana, the country whence Kipling has drawn much that is strangest and most heroic in his stories and verses. The king who died in "The Last Suttee" was "Lord of the Desert of Bikaneer," and in that spirited ballad are half a dozen names of places on or near the Jodhpur & Bikaner Railway.

To Pike's Peak by Automobile.

A press despatch from Manitou, Col., says: W. B. Felker and C. A. Yont, of Denver, climbed Pike's Peak in an automobile, Aug. 13. This has been tried several times but never was done before. The men started at daybreak. The distance is 14 miles over the old carriage road, which is little used and out of repair. The grades are not very difficult, but the road is cut by gulleys and obstructed at frequent intervals by boulders and fallen timber. Axes and shovels were brought into use many times during the day to make the road passable, but the travelers finally reached the summit about 3:30 p. m.

Rolling Stock For Belgian Roads.

The management of the Belgian Government Railroads contemplates a considerable increase of rolling stock in the near future. In addition to 570 cars already advertised for in the official gazette, the furnishing of several hundred passenger cars and 100 locomotives will be awarded under the bid system.

Train Robbery in Indian Territory.

A southbound passenger train of the Missouri, Kansas & Texas was stopped by robbers near Caney, Ind. T., at 1 o'clock on the morning of August 13 and the mail car, express car and the passengers were robbed. The express car was broken open by the use of dynamite. It is said that the amount of money taken from this car was small. How much was taken from the passengers is not known.

An Eighteenth Century Railroad Station.

A Philadelphia paper of recent date publishes an interesting little item about the station of the Pennsylvania Railroad at Bustleton, Pa., which is the terminus of a four-mile branch of the New York Division, about a dozen miles north of Philadelphia. The building in question was erected more than 150 years ago and it has served as a railroad station since 1860, when the Bustleton Branch was built. It appears that the people of the town have been quite content to use a small and inconvenient building because by so doing they enjoy the distinction of having the oldest station on the Pennsylvania road. (Probably it would be perfectly truthful to call it the oldest station in the country.) The compliment to the railroad company in this item is what may be called a left-handed one, as the reporter adds that the train service on the branch is in perfect keeping with the antiquity of the building. This unkind cut is based on the fact that there are no trains after about 7 o'clock in the evening. Whether or not a train in the evening would be used by enough passengers to pay for the oil or gas to light the cars is a question which, of course, the public-spirited reporter did not find time to look into.

The Foundations of St. Paul's Cathedral.

Some of the London newspapers are worrying now because the building of deep underground railroads appears to have disturbed the foundations of St. Paul's Cathedral. Some of these writers say that any more tunneling would destroy the cathedral. We would suggest that there are a number of gentlemen in New York who would like to go over and put caissons under the Cathedral, and so protect it for all time to come.

Electrical Equipment on Pennsylvania Lines.

The Pennsylvania has under consideration a plan for equipping the Springfield & Xenia branch, and the In-

dianapolis & Vincennes, between Indianapolis and Martinsville, Ind., with electricity. In the plan, as far as formulated, the trolley wires will be at the side of the track, not to interfere with the regular passenger and freight trains, and the main track will be used. The maintenance cost will not be greatly increased, and the cost of the change, including power house and cars, it is thought, will not exceed $7,000 per mile.

A Shipbuilding Plant at Halifax.

A company has been organized in Halifax, N. S., to operate a shipbuilding plant at the Port of Halifax and thus qualify for the several municipal and provincial bonuses that have been offered. On the Halifax side, the city of Halifax has offered $200,000 and the Province $100,000, and on the Dartmouth side, opposite, the town offers $100,000 and the Province $100,000 more, making a total of $500,000 for a plant operated on both sides of the harbor.

The Water Supply of Washington.

Col. A. M. Miller, Corps of Engineers, U. S. A., in charge of the water supply system of the District of Columbia, in his annual report notes considerable progress on the improving of the water supply of the city. During the year $357,603 have been expended on the tunnel and reservoir, and the amount still available, $117,922, is sufficient to complete the work. For the slow-sand filtration plant authorized by Congress, March 1, 1901, land has been bought, drawings have been made and preparations for beginning work are under way. An estimate of $1,000,000 for work on the filtration plant during the coming fiscal year is submitted, and it is said the completion of the plant will cost $1,786,123 in addition to about $675,000 already expended. The filtration plant is planned to purify 60,000,000 gallons of water a day. But Col. Miller calls attention to the enormous consumption and waste of water, the consumption in one day in June of this year measuring 53,960,998 gallons. Col. Miller suggests that either the amount used be regulated by meters, or that an increase of supply be provided.

Search-Light Signals.

Signals from the 30-inch search-light, on the Electric Tower of the Pan-American Exposition, were sent to Niagara Falls, July 25, by Prof. Geo. F. Sever, Superintendent of Electrical Exhibits, in the presence of the electrical jury. Since that time search-light signals have been sent from Buffalo to Toronto, 58 miles, through arrangements completed by Prof. Sever in co-operation with Mr. Wm. S. Aldrich, consulting electrical engineer, of Toronto. The first trial was made, 9:10 p. m., Aug. 9, with clouds over Toronto. The local illumination of the sky by the arc lights in the streets of Toronto prevented discrimination being made between the local and the Buffalo illumination of the clouds. The second trial was made, 9:50 to 10:15 p. m., Aug. 13, with a clear atmosphere. Owing to the smoke settling down over the city, no signals could be discerned from the top of the Municipal Hall tower, Toronto. This was the pre-arranged objective point for both experiments. The special instructions were to depress the search-light to the lake horizon, bearing on the Municipal Hall tower, Toronto; then to sweep the horizon a definite angle, to the right and left of this bearing; and later to elevate and depress the light at the original bearing. All of these signals were clearly discerned during the second trial, by Mr. C. H. Rust, City Engineer, Toronto, with a party on Centre Island, two miles off shore from the city.

Havana Dry Dock.

Naval Constructor H. G. Gillmor, U. S. N., who was recently ordered to Havana to examine the floating dry dock bought from Spain, estimates that about $40,000 will be required to put the dock in good condition, and asks that a regular dock force be sent to Havana to man the dock.

Repairs of Ships of the Navy.

The Secretary of the Navy has ordered that the repairing of all ships shall hereafter be done under the Bureau of Construction and Repair, instead of being divided among the several bureaus as at present, which has led to considerable confusion.

Oil Engines in Palestine.

Oil engines are now used in numbers in Palestine for pumping water from wells. The first attempt at introducing the engines is said to have been made about three years ago, by a German firm, the engines being small ones of 3 or 4 h.p. At first no one would try them, but finally the agent of the firm in question volunteered in one case to set up an engine free of expense by way of experiment, and this little installation worked so well that it quickly led to the placing of several orders for more. Since then about sixty oil engines have been set up in different places, practically all for plantation work, about two-thirds of the engines having come from Germany and the others from British makers, the British engines, it is said, growing in favor on account of their greater simplicity of construction.—*Cassier's Magazine.*

Destroyers Launched.

On Aug. 15 the torpedo-boat destroyers "Whipple," "Truxtun" and "Worden" were launched from the yards of the Maryland Steel Works, at Sparrow Point, near Baltimore, Md. These boats have 433 tons displacement. They are 245 ft. long, 23 ft. beam, and will have triple expansion engines, driving twin screws, and 8,350 i.h.p., and when the boats are running at their maximum speed of 30 knots an hour, the engines will make 330 revolutions a minute. The boats have a coal capacity of 200 tons.

Ottawa & Georgian Bay Canal Co.

A round-robin to the Canadian government has been procured, signed by three-quarters of the Members of Parliament, asking that the government guarantee the interest on 65 millions of bonds, the proceeds of which are to pay for the work on the canal and also interest and other costs for five years. The government may either take over the canal, or the company will administer it.

Snow Sheds Burned.

The sheds on the Oregon Short Line at Crater, Idaho, 1,800 ft. long, were entirely burned on Aug. 14.

Liquor Prohibited by the Illinois Central.

New orders have been issued, in accordance with which any employees found in saloons during working hours will be at once dismissed, and the same penalty will be fixed for any who are found intoxicated at any time, whether on duty or not. It is provided, however, that some official of the company must be a witness, as hearsay evidence will not be held against the men.

Gasolene Scows on Great Salt Lake.

It is said that the Century Mining Co. will put a line of gasolene scows on Great Salt Lake to carry ore from Park Valley to Salt Lake City. It is thought that a considerable saving will be effected over the present railroad rates.

Dynamite Explosions at Herkimer, N. Y.

On the evening of Aug. 19, about 10 o'clock, six men were killed by an explosion of dynamite in an engine house of the New York Central near which they were sleeping in the railroad yard at Herkimer, N. Y. A number of men, women and children living near were injured. There were three locomotives in the building, and these were wrecked. Windows were broken throughout the village and the shock was felt at Little Falls, 15 miles away.

Names for New York-Brooklyn Bridges.

The American Scenic and Historic Preservation Society announced last Saturday the awards of its prizes for the best and next best lists of names proposed for the East River bridges. The four bridges for which names were invited were the Brooklyn Bridge, the bridge known as the New East River Bridge, the bridge to be built between these two, or No. 3, and the Blackwell's Island bridge, or No. 4. The trustees did not consider any of the 121 lists submitted ideal, and it is probable that their recommendations to the bridge authorities will be a selection of the best suggestions from all. They are unanimous, however, in favoring the name Brooklyn Bridge for the present structure. The first prize is given to Miss Mary I. Smithson, of East Orange, N. J., who offered the names Brooklyn, Manhattan, York and Queens for the four bridges, respectively, and the second to Franklin T. Nevin, of Pittsburgh, Pa., who suggests Brooklyn, East River, Manhattan and Queens.

Yerkes in London.

With the registration of the "Metropolitan District Electric Traction Company, Limited," at Somerset House there came to light the names of the American capitalists who will help Mr. Charles T. Yerkes give London rapid transit. The company is capitalized for an even £1,000,000; only £336,000 stands in Mr. Yerkes' name. Some of the most important names and amounts in the certificate of association are as follows:

John J. Mitchell, Chicago	$100,000
Maryland Trust Company, Baltimore	400,000
George R. Webb and H. A. Parr, Baltimore	50,000
P. A. Calhoun, New York	250,000
Brown Bros. & Co., New York	250,000
Alex. Brown & Sons, Baltimore	100,000
Henry H. Rogers, New York	250,000
J. Wilcox Brown, Agent, Baltimore	250,000
Govett, Sons & Co., London	315,000
James Phillips, Jr., Boston	50,000
T. Jefferson Coolidge, Boston	225,000
Frederick Ayer, Boston	250,000
Charles F. Ayer, Boston	40,000
Lee, Higginson & Co., Boston	100,000
F. H. Prince, Boston	50,000
Charles G. Weld, Boston	100,000
Ginn, Booz & Co., New York	100,000
Pemberton & McAdoo, New York	100,000
J. G. White & Co., New York	200,000
F. H. Marckwald, New York	50,000

Electric Traction on Standard Railroads in Hungary.

The firm of Ganz & Co., whose name has been so prominently associated with the scheme for converting the Metropolitan to electric traction, is now making investigations and preparing plans at the instance of Minister of Commerce and Finance, with a view to the introduction of electrical working on the main lines of railway in Hungary. The railways in connection with which the investigations are being conducted are the four lines Buda-Pesth-Neuhausel Galanto-Silien, Salgotarjan-Rutka and Piszky-Petrozseny. It is intended as a result of this inquiry to introduce electrical working of the whole of the traffic on one of these lines by way of experiment as soon as possible.—*Railway News* (London).

LOCOMOTIVE BUILDING.

The American Steel & Wire Co. is getting prices on seven standard gage locomotives.

The Atchison, Topeka & Santa Fe is reported in the market for a large number of locomotives for delivery early next year.

The Maryland & Pennsylvania has ordered three engines from the American Locomotive Co. They will be built at Richmond.

The San Pedro, Los Angeles & Salt Lake has ordered two engines from the American Locomotive Co., to be built at Schenectady.

The Chicago, Rock Island & Pacific has ordered one Chautauqua type, 17 freight and 12 passenger locomotives from the American Locomotive Co. They will be built at Dunkirk.

CAR BUILDING.

The Southern has ordered one café car from the Pullman Co.

The Chicago & North Western will build 100 cars at its own shops.

The Chicago, Rock Island & Pacific is in the market for four passenger cars.

The Pittsburgh Oil Refining Co. has ordered 11 cars from the Erie Car Works.

The Chicago Union Traction Co. is building 30 electric cars at its own shops.

The Choctaw, Oklahoma & Gulf has ordered 50 cars from the Mt. Vernon Car Co.

The Paragon Refining Co., Toledo, Ohio, has ordered 20 cars from the Erie Car Works.

The Southern Indiana has ordered 550 freight cars from the Barney & Smith Car Co.

The Missouri Pacific has ordered 1,000 coal cars from the American Car & Foundry Co.

The Cleveland, Cincinnati, Chicago & St. Louis will build 100 coal cars at its own shops.

The St. Louis, Kansas City & Colorado has ordered one private car from the Pullman Co.

The Birmingham Light & Power Co. has ordered 20 electric cars from the St. Louis Car Co.

The Cincinnati, New Orleans & Texas Pacific has ordered one café car from the Pullman Co.

The American Car & Foundry Co. has an order from an individual corporation for 70 flat cars.

The Union Electric Co., of Dubuque, Iowa, is having 10 electric cars built by the St. Louis Car Co.

The Great Northern is reported to have ordered 2,200 coal cars from the Haskell & Barker Car Co.

The Blackwell, Enid & Southwestern has ordered 100 box cars from the American Car & Foundry Co.

The Southern Missouri & Arkansas has ordered three coaches and one private car from the Pullman Co.

The St. Louis & San Francisco has ordered 200 hopper bottom cars from the American Car & Foundry Co.

The Delaware & Hudson has been reported in the market for 1,000 coal cars. This is denied officially.

The Pueblo Light & Traction Co. have recently ordered six electric cars from the American Car & Foundry Co.

The Nashville, Chattanooga & St. Louis, it is reported, will soon be in the market for 15 cars for passenger service.

The Central of New Jersey is having one car built at the Huntington Works of the American Car & Foundry Company.

The Norfolk & Southern has ordered 25 freight cars from the American Car & Foundry Co. They will be built at Huntington.

The Atchison, Topeka & Santa Fe has ordered 750 refrigerator cars from the American Car & Foundry Co. Bettendorf bolsters will be used. It is reported the road will soon be in the market for a large number of passenger cars for April and May delivery.

The Southern Missouri & Arkansas has ordered from the Pullman Co. two passenger coaches and one baggage, mail and express car. They are for February, 1902, delivery, will measure 61 ft. long and have Westinghouse brakes, Pullman standard six-wheel trucks and Standard steel tires.

The Cold Blast Transportation Co. has ordered 100 refrigerator cars of 60,000 lbs. capacity from the American Car & Foundry Co., for November delivery. The specifications include American steel bolsters, Westinghouse air-brakes and Thornburgh draft riggings. The company is asking prices on 100 more cars of the same class.

The Kansas City, Fort Scott & Memphis has ordered 100 twin hopper gondolas and 100 side-dump cars, of 80,000 lbs. capacity (all for coal service), from the American Car & Foundry Co., for September and October delivery. The cars will weigh, approximately, 33,500 lbs. and measure 34 ft. long, 9 ft. 4 in. wide and 9 ft. 1 in. high over end sills. The specifications include American steel bolsters, Trojan couplers, American continuous draft rigging, Waycott-Andrews dust guards, Scott springs, and American Steel Foundry Co.'s trucks.

The Delaware, Lackawanna & Western has ordered from the American Car & Foundry Co. 1,000 box cars for October and November delivery, and from the Erie Car Works 100 cars of the same class for November delivery. They will weigh about 33,000 lbs., measure 34 ft. ¼ in. long, 8 ft. ¼ in. wide and 6 ft. 11¾ in. high, and have Gould axles and couplers, Simplex bolsters, Westinghouse brakes, Magnus brasses, Chicago double grain doors, Dunham door fastenings, Butler tandem draft rigging, Sherwin-Williams paint, Murphy inside roofs and Barber trucks. Three hundred of the cars will have Scott springs.

BRIDGE BUILDING.

Aiken, Md.—In our issue of Aug. 9, p. 565, we said that one span of the Baltimore & Ohio bridge over the Susquehanna here had been condemned. That report was erroneous.

Andover, N. B.—It is said that tenders will shortly be asked for by the Provincial Government for the superstructure of the Andover-Perth steel bridge, 1,044 ft. long. A. R. Wetmore is Provincial Engineer, Fredericton, N. B. (May 24, p. 355.)

Binghamton, N. Y.—Bids are wanted, Aug. 27, on the Exchange street bridge over Susquehanna River. The entire work will be let to one bidder. Address I. C. Hull, City Clerk.

Cambridge, Ohio.—Bids are wanted, Sept. 2, for a dozen or more small bridges in the County. Samuel Doak, Commissioner.

Cincinnati, Ohio.—Bonds for $250,000 will be sold, Sept. 10, for a viaduct to carry Grandin Road over Delta avenue. (July 19, p. 522.)

Cleveland, Ohio.—It is said that the County Commissioners will build an iron and steel bridge over the New York, Chicago & St. Louis tracks in Clifton Boulevard, hamlet of Lakewood. No plans yet made.

Des Moines, Iowa.—According to reports, bids will soon be wanted on a Melan arch bridge at Sixth street.

Doylestown, Pa.—The County Commissioners will receive bids until noon of Sept. 16 for a bridge at Kober's Ford, New Britain township.

The County Commissioners have granted permission to the Quakerstown Traction Co. to build a bridge over North Branch Creek.

Fayette, Ala.—The Board of Supervisors has advertised for bids on four bridges. Wm. Geoghegan, President.

Fergus County, Mont.—Notice is given that the Board of Road Trustees ask for bids for a single-span steel bridge 50 ft. long with roadway 16 ft. wide, over Warm Spring Creek, at Nave's Crossing, Mont. Bridge to be on steel piers. Further particulars obtainable from C. M. Kelly, County Clerk.

Bids are also asked for a steel bridge over Warm Spring Creek at the Moccasin City Crossing; single-span, 34 ft. long, with roadway 16 ft. wide. Height above low water, 8 ft. Bids for both bridges may be addressed to C. M. Kelly, County Clerk, Fergus County, Mont., until Sept. 6.

Fond du Lac, Wis.—Plans have been accepted, according to report, for the Chicago & Northwestern three-track bridge over Fond du Lac River at Scott street.

Hamilton, Ohio.—Sealed proposals will be received

at the office of the County Commissioners, Butler County, Ohio, until 11 a. m., Aug. 23, for a steel highway bridge across the Great Miami River, near Woodsdale, Butler County, Ohio. The bridge will consist of three spans, 161.28 ft., 161.28 ft., and 177 ft. long. Roadway to be 17½ ft. in the clear. H. C. Gray, Auditor, Butler County, Ohio.

Specifications are said to have been approved for a structure 968 ft. long to carry the Milcreek Valley Electric railroad over the Cincinnati, Hamilton & Dayton tracks at Schenck's Station, near Hamilton. The trestle includes a steel viaduct 100 ft. long, and the total estimated cost is $7,000.

Plans are approved by the Railroad Commissioners for an overhead bridge where the C. H. & D. and the Mill Creek Valley Electric railroads cross.

INDIANAPOLIS, IND.—Bids are wanted on the 26th, on a bridge over Big Run, Franklin township.

Bids are wanted, Sept. 9, for a bridge over Crooked Creek near Broad Ripple, also over White Lick, near Bridgeport. Harry B. Smith, County Auditor.

LOS ANGELES, CAL.—The Board of Supervisors will receive sealed proposals until 2 p.m., Aug. 26, for three concrete or stone culverts across Michigan avenue in the La Canada Road District. C. W. Bell, County Clerk.

MILES CITY, MONT.—The County has voted to authorize the Commissioners to build a highway bridge over the Yellowstone at a cost not to exceed $50,000.

MINNEAPOLIS, MINN.—The city will issue $215,000 bonds for the bridge proposed over the Mississippi from 32d avenue, N., to 25th avenue, N. E.

NEWARK, N. J.—The Newark city authorities and the officers of the Lackawanna Railroad are said to have agreed on the terms of track elevation for the railroad through Newark.

NEW YORK, N. Y.—Bridge Commissioner John L. Shea will receive bids until noon, Aug. 28, for the bridge over the Bronx River at Westchester avenue. The cost will be about $100,000, and the security required is $30,000. The bridge will be 172 ft.

OIL CITY, PA.—The Reno Bridge Co. has been incorporated with a capital of $10,000 to build a toll bridge over the Allegheny River in Venango County from near the lands of the Reno Oil Co.

PARKENHAM, ONT.—The contract for building a bridge 232 ft. long across the Mississippi River at this place has been let to James Tobin, of Ottawa, Ont.; price, $13,200.

PASSAIC, N. J.—The Freeholders of Passaic and Bergen counties will build a four-arch bridge over Passaic River at Monroe street at a cost of about $35,000.

PHILADELPHIA, PA.—The contract for the spans to be placed over Liberty street for the elevated tracks of the Pittsburgh & Fort Wayne to the new station in Pittsburgh, has been given to the American Bridge Company. The previous contractor, Andrew Brann, gave up the contract on account of labor difficulties.

PITTSBURGH, PA.—A span 120 ft. long of the new bridge from Fleming Park to Neville Island was broken down, Aug. 15, by projecting lading in a passing freight train.

SANDUSKY, OHIO.—The County Commissioners are said to contemplate building a $20,000 bridge on Huron street, half the expense of which is to be borne by the Lake Shore Electric.

SOURIS, MAN.—Tenders are asked for the building of two 25-ft. steel spans for a bridge across the Souris River, at Monteith, Man. Plans at the office of J. A. Simpson, Government Engineer, Winnipeg.

TORONTO, ONT.—It is said that the County Commissioners will build a new steel bridge over the Black River, at Udora, Ont.

VANCOUVER, B. C.—Tenders are being received by the Vancouver & Lulu Island Ry. Co., for a steel bridge across the north arm of Fraser River. N. Abbott, Vancouver, President.

WALKERTON, ONT.—Tenders are called for a steel bridge to replace Crispin's Bridge, at this place. Estimated cost, $5,000.

WASHINGTON, D. C.—In the annual report of the Engineer of Bridges of the District of Columbia, the bridge across the Anacostia River, known as the Navy Yard Bridge, is condemned. The bridge was built in 1875, and was not designed for heavy loads. It is now crossed by an electric car line.

Bids are wanted until Aug. 31, for a Melan arch bridge over Rock Creek on Rock Creek Drive. Lansing H. Beach, Engineer Commissioner.

WEISER, IDAHO.—Bids are wanted, Sept. 8, for a highway bridge over Weiser River. The cost not to exceed $5,500. I. F. Smith, Clerk to County Commissioners.

Other Structures.

ALLEGAN, MICH.—The present line of the Pere Marquette is to be carried further down town, and a new passenger depot built.

BAY CITY, MICH.—An agreement has been reached between the city officials and the Pere Marquette, whereby, in return for certain concessions, the railroad is to build a new depot, at a cost of $40,000.

CARNEGIE, PA.—The Carnegie Sheet Steel Co. has been organized by Pittsburgh capitalists to build a four-mill plant at this place. Geo. G. Gillespie, W. H. Skivington, D. R. Torrence, Jos. R. Paull and T. B. Everson are Directors.

CONSTABLE HOOK, N. J.—It is said that the Orford Copper Co. will build a new refinery for copper, as their present plant is inadequate. The new structure is to be about 400x800 ft., of brick and steel. It is to have a capacity of 1,000 tons a month.

HARRISBURG, PA.—The Central Iron & Steel Co. will hold a meeting on Aug. 29 to increase its capital stock from $1,000,000 to $5,000,000 to provide funds for at least six 50-ton open-hearth furnaces. Other improvements are also under contemplation and the plant is to be made entirely independent so far as providing its raw product is concerned.

KNOXVILLE, TENN.—The contract for building the new passenger station for the Southern has been let to Nicholas Ittner for $80,000. The station is to be of light brick with trimmings of Tennessee marble and includes a large train shed.

LANSING, MICH.—The Grand Trunk is reported considering building a new station here.

MORGAN, TEXAS.—By joint arrangement, the Gulf, Colorado & Santa Fe and the Texas Central will build passenger and freight depots at Morgan, on a triangular site formed by the junction of the two roads. (April 5, p. 244).

NEW YORK, N. Y.—Plans have been filed with the building department by Louis Hornum, architect, for enlargement of the Central Railroad of New Jersey's office on Liberty street. Three stories of brick and granite are to be added to the present ten story structure at an estimated cost of $150,000.

TAUNTON, MASS.—The new foundry building of the Taunton Locomotive Co. will be 185x45 ft. and will carry a 15-ton electric traveling crane and two core ovens. The walls are to be of brick, and the crane, foundry blower, elevator and rattlers will all be run by electric power. According to present estimates, a 500 volt generator of from 75-100 k. w. will be required.

TROY, N. Y.—The Standard Signal Co., successors to Standard Railroad Signal Co., has bought ten acres near Troy, on the line of two railroads, where an entirely new plant with enlarged facilities will be built during the next 18 months.

UTICA, N. Y.—It is said that an agreement has been made between the New York Central & Hudson River Railroad and the municipal authorities, by which the latter are to spend $150,000 in straightening the Mohawk River, which now runs up to the company's tracks opposite the station. In return for this, a new passenger station and freight yards are to be built, at a total cost of $600,000.

VANCOUVER, B. C.—It is said that the British Columbia Electric Ry. Co., operating electric street railroads in Vancouver, Victoria and New Westminster, B. C., will establish a car-building plant at Vancouver, and hereafter manufacture their own rolling stock.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Northwest Railway Club.

The next meeting will be held at the West Hotel, Minneapolis, Minn., Monday, Sept. 9.

American Association of Passenger and Baggage Transfer Companies.

This is the name of an organization which was formed at Buffalo, Aug. 15. The President of the Association is Mr. C. W. Miller, of Buffalo. Other officers are: First Vice-President, S. C. Cook, of the St. Paul Omnibus & Carriage Company; Second Vice-President, G. M. Hendrie, of the Detroit Omnibus Company; Third Vice-President, S. H. Bowman, of the Richmond (Va.) Transfer Company; Secretary and Treasurer, W. A. Brown, of the Brown Baggage & Carriage Company, of St. Joseph, Mo.

Eastern Maintenance of Way Association.

The Nineteenth Annual Convention of the Eastern Maintenance of Way Association will be held at the Whitcomb House, Rochester, N. Y., Sept. 17 and 18, 1901. Convenient to convention rooms there will be indoor space, provided by the association for exhibition purposes. Regular spaces will be 4x4, 4x8, 4x12, etc. This space will be in charge of the Supply Association for allotment, but all notifications for space, stating approximately the least amount of space wanted, should be sent to F. C. Stowell, Secretary, care B. & M. R. R., Ware, Mass., on or before Sept. 14. All such notices will be recorded in the order received. The following questions and papers will be taken up for discussion:

Efficiency and economy considered, is track best put in surface and final finish as the new ties are put in, or is it best to simply bar tamp the new ties as put in and go all over track again for final surface and finishing?

Paper—The Best Method of Training Sectionmen for Foremen. R. P. Collins, N. Y., N. H. & H. R. R.

What increase in the life of cross-ties can be effected by the use of better ballast, by thorough draining of roadbed, by use of tie plates and tie plugs, by preservation of their timber through different processes, by removal of bark and allowing the ties to season before using?

Paper.—Some Observations on "The Methods and Results of the Prize System in Maintenance of Way Work." E. A Haskell, B. & A. R. R.

Can life of the ends of the heavier rail sections be prolonged and breaking of bolts lessened by increasing the size of bolts? What should be the relative diameter of holes in rail ends and fastenings to bolts used?

Paper.—The Use of Floating Gangs. J. B. Stouder, C. & N. W. R. R.

The best method of maintaining public and private crossings at grade. Review of previous year's discussions.

Committees appointed by the Executive Committee will submit reports on these questions. Mr. W. L. Derr, Division Superintendent Erie Railroad, will deliver a lecture on the evening of Sept. 17.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. T. S. Gilchrist, Car Accountant of the West Virginia Central & Pittsburgh Railway, died Aug. 17.

—Sir William Laird, Chairman of the North British Railway Company, died recently at Glasgow. He was born in 1830. Sir William took a keen interest in politics and was President of the National Union of Conservative Associations of Scotland in 1895.

—Mr. Charles E. Miner, the General Western Passenger Agent of the Mexican Central, died suddenly at St. Louis, Mo., on Aug. 12. He was a native of Oriskany Falls, N. Y., having been born there in 1848. Mr. Miner began his railroad career in 1868 with the Utica, Clinton & Binghamton, now the New York, Ontario & Western.

—Mr. H. L. H. Blair, the new assistant to the General Manager of the Pennsylvania company, began his railroad career about 22 years ago as a clerk. He was born in 1858 at Yellow Creek, Ohio. The position of assistant to the General Manager is new and was created to divide somewhat the immense amount of work now devolving upon the General Manager of the Lines West of Pittsburgh.

—Mr. Alexander W. Graham, First Vice-President of the Louisville & Nashville, died at Petoskey, Mich., on Aug. 18. Mr. Graham suffered from a sunstroke in July and was taken to Petoskey, where he was attacked by typhoid fever, which was the direct cause of his death. He was 39 years old and entered railroad service in 1878 as a clerk in the local agent's office of the North British Railway, of Scotland. He was then made clerk in the traffic manager's office of the Grand Trunk, which position he held until 1887, when he went with the Louisville & Nashville. The following year (1888) he was appointed Chief Clerk, and in 1899 was made Traffic Manager, from which position he was promoted to the First Vice-Presidency of the company.

—Mr. F. W. Johnstone, Superintendent of Motive Power and Machinery of the Mexican Central Railway, has resigned, his resignation to take effect at the convenience of the railroad company. He goes into private business in the City of Mexico, where he will open a consulting engineering office with Mr. Rafael M. de Arozarena. The business of the National Iron & Steel Works in the City of Mexico also demands a good deal of his time. Mr. Johnstone has been 20 years in Mexico, all of that time with the Mexican Central, in charge of its motive power department. Mr. Arozarena is an American by birth and a man of considerable acquaintance and note as an engineer. The new firm will be prepared to advise clients in the United States and in Mexico as to engineering work, mining properties, etc. Mr. Johnstone has made an enviable reputation as a railroad officer and his retirement is a loss to the railroad service.

ELECTIONS AND APPOINTMENTS.

Central New England.—J. F. Hedden, heretofore Trainmaster, has been appointed Assistant Superintendent, with headquarters at Hartford, Conn.

Central Vermont.—J. M. Morrison has been appointed Engineer and Superintendent of Structures, in charge of the Engineering, Bridge and Building Departments, succeeding James A. Sheedy, Superintendent of Bridges and Buildings, who has resigned, to take service with another company. The position of Superintendent of Bridges and Buildings has been abolished, effective Aug. 15.

Cincinnati, Richmond & Muncie.—R. M. Rogers has been appointed General Freight and Passenger Agent, with headquarters at Richmond, Ind., succeeding J. J. Archer, resigned, effective Aug. 15.

Detroit Southern.—G. Crocker has been appointed Chief Engineer.

Duluth & Iron Range.—R. Angst, as Chief Engineer, will have charge of all construction and maintenance of all tracks, buildings, bridges, water tanks and other structures. W. A. McGonagle has been appointed Assistant Chief Engineer.

Jamestown & Chautauqua.—R. J. Bootey, heretofore General Superintendent of the Chautauqua Steamboat Company, has been appointed General Superintendent of the J. & C., with headquarters at Jamestown, N. Y. The position of General Manager has been abolished.

Kansas City, Fort Scott & Memphis.—The jurisdiction of the following officers of the St. Louis & San Francisco have been extended over all lines of the K. C., Ft. S. & M.; B. L. Winchell, Vice-President and General Manager; A. Douglas, Vice-President and General Auditor; C. H. Beggs, Vice-President and Assistant to General Manager; Guthrie, Cravath & Henderson, General Counsel; L. F. Parker, General Solicitor; F. H. Hamilton, Secretary and Treasurer; Frederick Strauss, Assistant Secretary and Assistant Treasurer; A. R. Dodge, Freight Traffic Manager; Bryan Snyder, Passenger Traffic Manager; J. A. Middleton, General Freight Agent; Charles Hall, H. G. Wilson, F. C. Dumbeck and E. K. Voorhees, Assistant General Freight Agents; A. Hilton, General Passenger Agent; James Donohue, Assistant General Passenger Agent; J. T. Woodruff, Assistant General Solicitor; W. B. Spaulding, General Claim Agent; W. P. Newton, Assistant General Auditor; George A. Hancock, Superintendent of Machinery; A. J. Davidson, General Superintendent; R. R. Hammond, Superintendent of Maintenance; C. P. Gray, Superintendent of Transportation; C. D. Purdon, Chief Engineer; J. V. Hanna, Assistant Chief Engineer; William Dyer, General Baggage Agent; H. C. Sprague, Superintendent of Telegraph.

Macon, Dublin & Savannah.—G. A. Whitehead has been appointed Resident Engineer.

Manistee & Grand Rapids.—J. W. Murray, Assistant Traffic Manager, will have general supervision of the operating and traffic departments. F. S. Beil becomes Auditor, and J. D. Bertrand, Car Accountant.

Norfolk & Western.—We are informed that there is no foundation whatever for the report that James C. Cassell, General Superintendent, has resigned. Of course, it follows from this that T. Low does not become the General Superintendent.

Oregon Short Line.—T. M. Schumacher has been appointed Traffic Manager.

St. Lawrence & Adirondack (New York Central & Hudson River.)—A. L. Meyer has been elected Vice-President.

Southern Pacific.—It is very generally understood from despatches from the West that Chas. M. Hays, President of the S. P., will soon resign. Up to the time of going to press no official confirmation has been received. Mr. Hays' resignation may be announced to the executive committee at its meeting on Thursday. C. K. Dunlap, heretofore General Freight and Passenger Agent of the Mexican International, has been appointed General Freight Agent of the Atlantic System of the S. P.

Vandalia Line.—W. H. Coleman has been appointed Assistant General Freight Agent, with headquarters at St. Louis, Mo., effective Aug. 20.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALABAMA, MISSISSIPPI RIVER & GULF.—Surveys are reported for a railroad from Tupelo, Miss., 81 miles west through Water Valley and Clarksdale to Friar Point, Miss. Capt. H. P. Farrar, of Jackson, Tenn., is Chief Engineer, and Z. D. Jennings, of Water Valley, President.

APALACHIA SHORT LINE.—Work is reported begun on a branch from a junction with the Atlanta, Knoxville &

Northern, at Apalachia, Tenn., to Goen's Cove, N. C., to be subsequently extended to Murphy, N. C., 30 miles southeast.

Atchison, Topeka & Santa Fe.—The Rayburn-Silsbee, Texas, extension, 47 miles long, was reported opened Aug. 11.

Carolina & Northern Railroad.—This road is reported graded from Lumberton, N. C., 47 miles southwest to Marion, S. C., and tracks laid for 25 miles. The road will probably be completed by Oct. 1.

Central New England.—Articles of incorporation have been filed in Hartford, Conn., for the East Granby & Suffield. This line will be but a trifle over four miles in length, and is incorporated to give the Central New England entrance into Hartford. It is necessary to build around a farm which is controlled by the N. Y., N. H. & H., and the estimated cost is nearly $100,000, on account of the difficulty of construction. C. F. Hurst, of Cambridge, is the chief shareholder.

Charleston & Kanawha Valley Power & Ry. (Electric).—This company has been incorporated in West Virginia with a capital stock of $500,000, to build electric railroads connecting Montgomery, St. Albans and Kanawha Falls with Charleston, W. Va. The incorporators are: T. J. Carmack, of Charleston; E. D. R. Sutton, of Wilmington, Del.; and H. T. Goodwin, J. W. Coburn and C. M. Coburn, of Philadelphia, Pa.

Chateauguay & Northern.—Contracts for the grading of this new line between Montreal and Joliette, Que., 37 miles, to a junction with the Great Northern of Canada, are said to have been let to Smith and Abbott, of New York, who will also put up the masonry of the bridge at Bout de l'Isle, Que.

Cherokee & Red River.—Application has been made in Kansas for a charter for a line to run from Joplin, Mo., 15 miles west to Galena, Kan., in the zinc mining district. The Kansas, Missouri & Southeastern, recently chartered to run from Pittsburg, Mo., to Galena, is thought to be an auxiliary. The St. Louis & San Francisco would be paralleled between Joplin and Galena.

Chicago & Calumet River.—This company is incorporated to build a terminal railroad from the First Ward, Chicago, through South Chicago, Lake, Hyde Park, Kensington, Pullman, Hegewich, Colehour, Whiting and Hammond, to a point within the last named place. The capital stock is $100,000, and the incorporators are D. L. Markle, D. L. Chestnut, A. R. Sheriff and C. V. Freeman, of Chicago, and A. L. McCordic, of Winneta, Ill.

Chicago, Rock Island & Pacific.—The line is being graded between West Liberty and Iowa City, Iowa, 15 miles, preparatory to double-tracking.

This company has recently made two surveys for a route from a point on its Des Moines-Winterset line to the site of the Army Post three and one-half miles south of Des Moines. The routes surveyed were about three miles in length.

Choctaw Northern.—It is said that the branch of this road has been completed in Oklahoma from Geary, Blaine County, on the Choctaw, Oklahoma & Gulf, 49 miles north through Wurtonga and Homestead to Rusk, near the Cimarron River, and is now in operation between these points. An extension to Augusta, and a branch in Arkansas, making a total mileage of 138, are building. C. E. Ingersoll, of Philadelphia, Pa., is President.

Choctaw, Oklahoma & Gulf.—The contract for building a 22-mile connecting link from near Benton, Ark., to Butterfield, is reported let to Corrigan & Co., of Memphis, Tenn.

Crow's Nest Southern.—Surveys are reported finished on this line from the Michel coal mines, B. C., 65 miles south to the International boundary, where connection is to be made with the Montana & Great Northern. (June 14, p. 422.)

Decatur, Danville & Southwestern.—It is reported that surveyors have arrived to survey the line of this road in Alabama, and that the contract has been closed for first 40 miles of grading. The road was prospected last winter by John Carlisle and others.

Detroit & Flint (Electric).—This company, capitalized at $250,000, has filed articles of association in Michigan, to acquire the franchises, etc., of the Detroit, Rochester & Lake Orion, North Detroit Electric, and Detroit, Utica & Romeo. Homer Warren, of Lansing, is the chief stockholder.

Flint River & Gulf.—J. C. Turner, W. N. Spence, and others, of Camilla, Ga., have applied for incorporation of a road to be built 90 miles west from Ashburn, Ga., to Bainbridge, via Sylvester and Camilla. T. R. Bennett, of Camilla, Ga., is Secretary.

Georgia Roads.—It is said that T. J. James, of Adrian, Ga., President of the Wadley & Mt. Vernon, will build a railroad from Douglas, Ga., on the Waycross Air Line, 21 miles north to the Ocmulgee River.

Grand Forks & Republic.—The contract to build this line from Grand Forks, B. C., to Republic, Wash., 42 miles southwest, has been let to G. S. Deeks & Co., to be completed Nov. 1. The Canadian section, five miles long, from Grand Forks to the International boundary at Carson, is to be built under charter of the Grand Forks & Kettle River railroad.

Harlow & Northern.—This company has been incorporated in Arkansas with a capital stock of $130,000, to build a road in Calhoun and Dallas counties. The incorporators are: George D. Hope, S. M. Barnes, S. J. Grimmett and E. M. Hope, of Harlow, Ark.

Idaho Roads.—It is said that the Northern Pacific, in connection with the Chicago & North Western, will build the projected line along the Snake River west from Lewiston, Idaho, to Riparia, Wash. The air-line distance between these points is about 55 miles; the course along the river, much longer. According to the same report, the so-called Clear Water line, of the Northern Pacific, is to be extended 18 miles south from Stiles to Grangeville, Idaho, and an extension of the Lapwai line of the Northern Pacific is to be built into the Clear Water white pine belt, Idaho.

Jersey City, Hoboken & Paterson (Electric).—The stockholders met Aug. 15 to ratify the guarantee of $1,000,000 first mortgage bonds issued by the Bergen Turnpike Co. for the purpose of building a trolley line from Hackensack to Hoboken, 10 miles.

Kansas, Missouri & Southeastern.—This company has been granted charter in Kansas to build a road 27 miles southwest from Pittsburg, Kan., to a point on the state line three miles east of Galena. The capital is $10,000, and the directors are R. Nevins, Jr., and others of Joplin, Mo., John McCullagh, and others of Galena, Kan. and J. R. Lindburg and T. P. Waskey, of Pittsburg.

Kansas, Oklahoma & Southwestern.—Incorporation has been granted in Oklahoma for a railroad to run from Coffeyville, in the southern part of Kansas, near the Indian Territory line, through Bartlesville, Ind. T., and Stillwater, Okla. T., to Oklahoma City, a total of nearly 200 miles southwest. The incorporators are: H. and E. Overholser, of Oklahoma City; S. M. Porter, of Caney, Kan., and C. M. Ball and F. Butcher, of Coffeyville, Kan. It is thought that the Missouri, Kansas & Texas is interested. (See St. Louis & San Francisco, below.)

Kentucky Roads.—A company has been incorporated at Danville, Ky., to build a road from Corbin, Ky., on the Louisville & Nashville, 40 miles west to Burnside, on the Cumberland River, and the Cincinnati, New Orleans & Texas Pacific R. R. Coal and timber lands will be penetrated. The incorporators are G. W. Mallon and S. Woodward, Cincinnati; G. M. Patterson, L. F. Hubble, J. M. Logan, and W. H. Kinnaird, of Lancaster, and Judge Denton, of Somerset.

Lindsay & Pembroke.—Surveys are reported for a proposed railroad from Golden Lake, 62 miles southwest to Bancroft, Ont., and it is said that work will begin soon.

Marion & Northwestern.—The principal shareholders of this company (July 26, p. 540) are: W. C. Perkins and J. W. Greenlaw, of 45 Milk street, Boston, Mass. The minimum capital is $10,000; authorized, $3,000,000. The purpose of the company is to reach coal fields in Tennessee, but no terminals have as yet been decided upon.

New York Roads.—Work is reported begun on a new Adirondack railroad, to run from Glendale, on the Rome, Watertown & Ogdensburg, 15 miles due east to Osceola.

Onaway & North Michigan.—This company has been incorporated under the laws of Michigan with a capital stock of $50,000, to build a railroad 5½ miles long in Presque Isle County, Mich. The stockholders are: Merritt Chandler and R. H. S. Chandler, Onaway; C. R. Miller and A. M. Miller, of Adrian, and C. E. Cheney, H. P. Cheney, D. A. Stratton and A. A. Stratton, of Alpena, Mich.

Ontario Roads.—It is said that an electric road will be built from St. Mary's to Mitchell, Ont., 30 miles, paralleling the Grand Trunk. Further extensions of the line are intended.

Perkiomen Valley (Electric).—A charter has been granted this company in Pennsylvania to build an electric road 30 miles long from a connection with the Lehigh Valley Traction, at Schwartz's Corners, Lehigh county, southeast through the towns of Vera Cruz, East Greenville, Pennsburg, Sumney and Skippack to Collegeville, where a connection will be made with the trolley line now running to Philadelphia. The Perkiomen Railroad will be paralleled for most of the distance. George F. Coffin, of Easton, Pa., and Col. H. C. Trexler, of Allentown, Pa., are interested.

Republic & Kettle River.—Contracts have been let as follows: First three miles out of Republic, Wash., Beck & Hall; two miles near Curlew, J. A. Munson; two miles between Lambert Creek and Curlew, John Lane, and the following two miles, J. Darrow; a total of nine miles.

St. Louis & San Francisco.—It is said that this company plans an immediate extension from Oklahoma City northwest towards Lawton, Ind. T. (See Kansas, Oklahoma & Southwestern, above.)

St. Louis, Kennett & Southern.—The Clarkson Branch of this company has been incorporated in Missouri, with capital stock of $40,000, to build 16 miles of railroad in the state. L. B. Houck, C. T. Lewis and others of Cape Girardeau, Mo., are said to be interested.

Sheboygan-Elkhart Lake (Electric).—This company has been organized in Sheboygan Falls, Wis., with a capital stock of $200,000, to build an electric freight and passenger line from Sheboygan to Elkhart Lake, 22 miles. John M. Salman, of Sheboygan, is President.

Southern.—Surveys are reported for a spur at Newcomb, Tenn., to connect the property of the Smith Blue Gem Coal Co. with the railroad. The distance to be traversed is less than a mile, with a 4 per cent. grade. The coal at present is hauled in wagons.

Southern Missouri & Arkansas.—Contract for 51 miles of road from the state line in Clay county, near Poplar Bluff, Mo., and extending to Pocahontas, Randolph County, Ark., has been let to J. H. McCarthy, of Little Rock, Ark. When completed, it will be a continuation into Arkansas of the road now in operation from Cape Girardeau to Poplar Bluff, Mo.

Western Railroad Construction Co.—Charter has been granted in Oklahoma to this company to build a road from Pueblo, Colo., to Fort Smith, Ark., with a branch to Dallas, Texas. The estimated length of the proposed line is 1,000 miles, and the estimated cost, $25,000,000. The capital stock of the company is $250,000, and the following are among the incorporators: H. E. Havens, of Enid, Okla. T.; P. W. Master, Kansas City, Mo.; C. J. Turner, Muscogee, Ind. T.; and C. J. Barth, of Chicago.

White Pass & Yukon.—An officer denies the current reports that this company is to build any extensions this year.

RAILROAD NEWS.

Blue Ridge.—A suit involving $4,000,000, the entire amount of scrip issued by the above company, has been filed in the United States Circuit Court at Charleston, S. C. The validity of the scrip is doubted, and the suit is a test case.

Cumberland & Ohio Valley.—See Louisville & Nashville below.

Detroit & Pontiac.—A mortgage to the Washington Trust Co., of New York, has been filed to secure the payment of $1,100,000 of 25-year 4½ per cent. bonds, to provide for double tracking and betterments.

Hudson Valley (Electric).—This company has been incorporated in New York State to take over the Glens Falls, Sandy Hill & Fort Edward (electric), the Stillwater & Mechanicsville (electric), and the Greenwich & Schuylerville Electric, the Saratoga Traction and the Saratoga Northern (electric). These roads are all in operation except the last mentioned. The capitalization of the new company is $2,600,000. A. B. Colvin is President, with office at Waterford, N. Y.

Illinois Central.—The following propositions will be considered at the meeting of the stockholders, Oct. 16: First, purchase of the line owned by the Peoria, Decatur & Mattoon, now operated by the I. C. This line extends southeast from Pekin, Ill., to Mattoon. Second, Purchase of the railroad owned by the Mattoon & Evansville Co. (now operated by the Illinois Central), beginning at Mattoon and extending southeasterly to the boundary line between White County, Ill., and Posey County, Ind. Third, Purchase of the railroad in Indiana extending from the boundary of White County, Ill., and Posey County, Ind., there connecting with the Mattoon & Evansville line to the city of Evansville, including also (if found practicable) the branch line extending from a connection at Stewartsville, Posey County, with the Mattoon & Evansville line to New Harmony, Ind. The stockholders will also be asked to approve the issue of 132,000 shares of new stock. (July 26, p. 540.)

International & Great Northern.—First and second mortgages for $10,000,000 were filed at Bryant, Texas, Aug. 10, to secure bonds for the construction of the road.

Lancaster & Chester.—$135,000 of bonds are to be issued, the proceeds of which are to be spent by this South Carolina road in changing its line to standard gage. The Lancaster & Chester is a 29-mile line from Lancaster west to Chester, S. C., and is at present 3 ft. gage.

Louisville & Nashville.—It is announced that this company has bought the Cumberland & Ohio Valley, sometimes called the Bloomfield & Shelbyville, for $150,000. The road runs between Bloomfield and Shelbyville, Ky., 26 miles. In previous years it has been owned by the L. & N. and by the Southern.

Missouri, Kansas & Texas.—The gross earnings for the year ending June 30 were $15,403,083, as opposed to $12,626,512, the preceding year; an increase of $2,776,571. The operating expenses and taxes for the same period were $11,134,146, increased from $8,765,469, of the preceding year, $2,368,677, leaving $4,268,936 net earnings, and a surplus of $761,779, after deducting interest on bonds and rentals. The surplus last year was $407,657.

Newfoundland Ry.—The following agreement has been made between this company and the Government of Newfoundland: At the end of the 50-year contract with R. G. Reid, the Government is to get the reversion of the railroad, and is to pay for all improvements and additions that may be made to it in the meantime. Reid returns to the Government 1,500,000 acres of land which he received, retaining 2,650,000 acres. For the reversion of the railroad and the surrender of land the Government agrees to pay $2,025,000. Another claim of Reid's for $1,250,000 for extras in the building of the road will be referred to arbitration. A new company, known as the Reid-Newfoundland Co., will handle the property in the meantime.

Nova Scotia Eastern.—It is reported that the Nova Scotia Eastern and the Musquodoboit companies have consolidated, placing the building of about 210 miles of road under the above management. The new line will extend from New Glasgow to Country Harbor and the Strait of Canso, with a second section from near Windsor Junction to Musquodoboit, joining the former at some point east of the Strait of Canso, probably Melrose. The directors of the consolidated companies are: J. W. Grier, M. H. Fitzpatrick, Hon. J. Stratten, Angus McLeod, M. P., George McCormick, M. P., T. P. Coffee, and C. Keopher.

Omaha & St. Louis.—The bondholders' committee, acting under agreement of May 10, 1900, inform the holders of certificates of deposit issued by the Union Trust Co. for first mortgage 4s that a contract has been entered into with the Wabash, in accordance with which the latter shall acquire the property upon confirmation of the foreclosure sale (provided it can be obtained at a satisfactory price) shall pay the net liabilities, not to exceed $475,000, and shall issue upon the property $3,500,000 of 3½ per cent. 40-year first mortgage bonds. The holders of Union Trust Co. certificates of deposit will receive $800 in new bonds for each $1,000 of Omaha & St. Louis bond.

Oregon Short Line.—By an injunction granted at Carson City, Nev., Aug. 9, this company is restrained from interfering in any way with the San Pedro, known as the Senator Clark Road, in Lincoln County, Nev. About 150 miles of the proposed line is covered by the decision.

Railways Co. General.—Negotiations are said to have been concluded for the sale of the Michigan Traction Co. to Western interests. The above company owned $400,000 of the total $500,000 Michigan Traction stock, and $6,000,000 first mortgage 5 per cent. bonds. The entire authorized bond issue of $700,000 was sold early this year.

Toledo Railways & Light.—This new company has taken possession of the property of the Toledo Traction, and assumed the $6,000,000 existing bonds. It has also filed a new mortgage to the U. S. Mortgage & Trust Co., of New York, to secure $12,000,000 of 4 per cent. gold bonds, due July 1, 1909, but subject to call at 102½ and interest.

Wabash.—Action will be taken, Oct. 8, on the following propositions: First, to acquire the property of the Boone County & Booneville, extending from Centralia to Columbia, Mo., 20 miles, payment of principal and interest on the bonds of the latter, not to exceed $300,000, to be guaranteed, secured by first mortgage on the B. C. & B. Existing liens on said road to be discharged with $200,000 of the above issue, and $100,000 to be retained by the Wabash for betterments, and acquisition of new property.

Second. To acquire the Omaha & St. Louis, and to consider whether, as consideration therefor, the Wabash shall issue its own bonds secured by first mortgage on the O. & St. L., or guarantee payment of the principal and interest of the bonds of another company, secured by first mortgage on said railroad to an amount not exceeding $3,500,000, said bonds to bear interest at a rate not exceeding 3½ per cent.

Wiscasset, Waterville & Farmington.—A mortgage for $1,000,000 has been filed at Skowhegan, Me., to raise funds for building and equipment. The mortgage covers all the land, franchises and other property of the company.